

ARTIS MICROPIA

PRESS KIT

ARTIS-Micropia

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ARTIS: the interconnectivity of life

ARTIS is a collection. A joining together of collections that complement and support each other. It is a collection that spans the spectrum from living flora and fauna to the park landscape designed by human hands. It extends from macro nature being made visible in the Planetarium to a historical archive and a collection of art objects. Science is also at the heart of this compilation of knowledge, with everything ranging from academic collections containing skeletons and other natural history objects to books and illustrations in the ARTIS Library (ARTIS-Bibliotheek). A collection of historical buildings designed to accommodate this myriad of collections completes the circle. The purpose of this family of collections was and is to facilitate learning about the natural world, expanding our insights and enlarging the knowledge of the world of plants and animals, stones and skeletons, sculptured animals and illustrated butterflies.

The foundations for all these collections lie in developments and achievements of the past. This past has in recent years been steadily reassessed, revised and restored according to the vision of the master plan for the future of a renewed ARTIS. But this vision has not yet been brought to full fruition. The future of ARTIS calls for a paradigm change, a materially renewed basis. This is why an important new chapter is being added to the tradition of collecting, displaying and experiencing the natural world. It is impossible to fully understand the interconnectivity of the natural world without knowledge of the most powerful, most successful and, at the same time, the smallest life form: micro-organisms. This invisible world will be revealed in the new Micropia museum using state-of-the-art aids. It will give us the unique opportunity to become acquainted with a form of natural life that also lives on and in us. We are, after all, also part of the collection of natural life. This intimate connection between nature and culture will also be brought to light in the new Groote Museum for Biodiversity and the Relationship between Nature and Man. Micropia and the Groote Museum will collectively reinstate ARTIS' museological tradition. The ARTIS Library is a project being carried out by ARTIS in association with the University of Amsterdam and the addition of its collection will furthermore contribute to the fulfilment of this vision in the future.

There will also be a spatial aspect to this new educational and scientific vision: Artisplein, comprising the renovated Ledenlokalen (Members' Rooms) and Groote Museum which is due for renovation, will be the most important renewal in the history of ARTIS. The square is open to everyone and connects history with today's world, collections with the buildings that house them, the city with the park and education with the public. This is the mission of ARTIS: to help a wide public discover and experience the interconnectivity of life and nature and to encourage the love of and concern for the natural world. This objective is of vital importance to our civilisation: we cannot understand human identity without grasping how nature and human civilisation are fundamentally bound up in and dependent on each other.

Micropia's vision, mission and platform

Vision

Micropia will connect science with its various stakeholders, encouraging a wide public to discover microbiology from an early age. That is how Micropia will boost the image of microbiology in our society, leading to more students, more co-operation between the various stakeholders, more support from society at large and more innovation. In the process, Micropia is set to become an international platform for microbiology.

Mission

Micropia shows the invisible, opening up the world of microbes to a wide public. It provides information on current issues, on the importance of microbes to humans and the natural world, and on the possibilities they offer for the future. Micropia, through the museum, activities and website, will connect scientists, politicians, the business community, students, school pupils, journalists, and everyone who is interested.

Objectives

Objective 1: to introduce the general public to microbiology and encourage interest in it, stressing its importance and possibilities for man and nature;

Objective 2: to provide a platform connecting scientists, students, school pupils, politicians, the business community, journalists, investors and everyone who is interested;

Objective 3: to offer a location where people involved in microbiology can meet and engage and inspire a wide public;

Objective 4: to encourage students and school pupils to choose studies and further studies in science or a scientific career, and to attract students from the Netherlands and abroad to Amsterdam;

Platform

Micropia's platform will bring together microbiology's scientists and various stakeholders, pro-actively connecting, stimulating and facilitating.

It will connect the science with students, school pupils, the business community, politicians, journalists, investors, and everyone who is interested;

It will stimulate scientific studies, investment, research and publications, and will encourage more support in society as a whole;

It will facilitate by offering practical information and activities.

Former ARTIS-director Haig Balian on the idea of Micropia

“After I had finished secondary school, I wanted to be an ecologist. An increasingly complex world meant you had to be a specialist; people couldn’t be generalists any more. An ecologist was one of the few who could keep the interconnectivity of life in mind. This interconnection between species is fundamental. The quality of our lives is totally dependent on nature. We need it to live, to grow the food we eat and to produce medicines. It also has enormous economic value. Nature is increasingly vulnerable in today’s world and is disappearing in too many places around the globe. There’s more and more destruction and the results will be disastrous if we don’t turn things around soon. At the end of the day, it’s about the survival of our species.

ARTIS was somewhere I loved visiting as a child and, before I became director eleven years ago, I asked myself the question: what’s a zoo for, nowadays? Is it a mausoleum for endangered species? What should you do with a limited amount of space and 27 listed buildings in the heart of Amsterdam? Is it totally outdated to lock up animals in order to educate the public? And anyway, is there any point to educating people about the natural world? What does nature mean to us? And how should we deal with it? Those were the essential questions to ask about ARTIS.

That’s how I came to the conclusion that ARTIS should be all about education. And that ARTIS could be fundamentally renewed by opening the world’s first ‘zoo’ for micro-organisms.

Zoos have traditionally tended to show just a small part of nature: large mammals and other animals which are of obvious interest. That’s what I wanted to change. If you want to tell the public something about nature, you have to let them see how interconnected the natural world is. Nature isn’t made up of disconnected elements, in which an extinct animal can be replaced by a new species: every part of nature is to do with the other parts. Animal with plant, plant with earth, earth with microbes, with the universe, with sunlight. ARTIS is so much more than just a zoo. It’s a place where animals, plants, stars, heritage, art and education all come together. Micro-organisms are now being added to this list.

This is the very first time that this most ancient part of nature has been opened up to the general public. The reason why ARTIS, one of the world’s oldest institutions to be dedicated to the natural world, is opening a micro-nature museum stems from an existential question: how can you create a vital connection with nature in the middle of a city, with limited space and means at your disposal? Although these external motivations were important, I also had an internal motivation: opening Micropia would fulfil the ecological dream of my youth, the desire to show the full extent of nature’s interconnectivity.

Paradigm shift

Major changes are often caused by social, economic and/or technological developments. The opening of Micropia is part of a paradigm shift: social, economic and technological changes are afoot. For years, nature has been neglected and subjugated to the economy. Society is experiencing a change of heart at the moment: we are becoming aware that we will have to behave differently towards the earth. We realise that climate change is causing economic damage. Part of the solution lies in honing existing technology. Endless improvements, since Van Leeuwenhoek (the ‘father of Microbiology’) in the Dutch 17th century, have led to the development of micro-technology. It’s a distinct possibility that new uses for this technology will be found as a result of the exploration of the world at microscopic level, made possible by enormous technological advances, microscopy, information technology, biochemistry and the unravelling of DNA. Microbiology could help solve global problems. However, before this can happen, the gulf between science and the general public will have to be bridged.

The opening of Micropia also represents a paradigm shift for ARTIS, from large to small. In the 1960s, ARTIS had 1,360 species of animals but, nowadays, we prefer to have fewer. Today, we are going to display micro-nature, which is set to provide us with so much in the future.”

Haig Balian, ARTIS-director

The idea and purpose behind Micropia (summary)

You can't see them, but they're here.

They are on you. In you. And you've got more than a hundred thousand billion of them.

They're with you when you eat, when you breathe, when you kiss.

They are everywhere. On your hands. And in your belly.

And they meddle in everything.

They shape your world:

what you smell, and what you taste;

whether you get sick, or get better.

They can save us or destroy us.

Microbes: the smallest and most powerful organisms on our planet.

We know very little about them,

but can learn so much from them.

About our health, alternative energy sources, and much more.

When you look from really close,

a new world is revealed to you.

More beautiful and spectacular than you could ever have imagined.

Welcome to Micropia.

The only museum of microbes, in the centre of Amsterdam.

A new museum called Micropia, the only one of its kind, has opened in ARTIS' historical Ledenlokalen. It has added an important new chapter to our tradition of collecting, displaying and experiencing the natural world. It is impossible to fully understand the interconnectivity of the natural world without knowledge of the most powerful, most successful and, at the same time, smallest organisms. Microbiology can help solve global problems, from water purification to developing new ways to cure infectious diseases. It can produce energy, food and bio-plastics. There is no end to its uses.

There is, though, a serious knowledge gap between the science and the general public. If there is any generally held view about the invisible micro-world at all, it is a negative one. Unknown is unloved. This is dangerous, because the lack of understanding and the preconceptions about microbes lessen support among the public for the scientific work being done and this has a negative effect on innovation.

ARTIS has 178 years of experience in interpreting complex science for the general public. Micropia puts this expertise to the service of this microscopic world waiting to be discovered. The museum opens up micro-nature which promises to give us so much in the future.

Micropia is set to inspire the general public, encouraging their interest in the smallest, most successful organisms from an early age. Micropia is not just a museum, but also provides a platform, a link between the general public and science. Seeing and experiencing will be kept central, with the focus on the (mostly positive) relationship between microbes and the visitors themselves. This will bring microbiology startlingly close, while the smart provision of information will allow everyone, from the youngest amateur to the oldest expert, to find exactly what they are looking for. One thing is sure: after visiting Micropia, you will never see yourself, or the world, in the same way again.

The idea and purpose behind Micropia (longer version)

You can't see them, but they're here.

They are on you. In you. And you've got more than a hundred thousand billion of them.

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A new museum called Micropia, the only one of its kind, has opened in ARTIS' historical Ledenlokalen. The visible natural world has been on display at ARTIS for a very long time but behind this is an immense invisible world, the world of microscopically small life. About two-thirds of all life on earth is not visible to the naked eye. These organisms are on your tongue, under your arms, in your intestines and on your skin. Whatever you think of, no matter how weird, microbes live on it, in it or round it. Huge numbers of viruses, bacteria, and fungi enter our bodies every time we breathe in. When we eat, hundreds of thousands of bacteria in our gut help us digest

our food and stay healthy. All this goes on 24 hours a day. The microbes' only aim in life is to multiply. You carry about one and a half kilos of microbes with you every day of your life.

Around 700 species of bacteria live in your mouth alone and more than 100,000 bacteria belonging to more than 1,000 different species live on every square centimetre of skin. Microbes may be small but they are ever-present and determine the composition of our world. Without microbes, there would be no life on earth. Micropia reveals this least visible yet most powerful of the earth's life forms.

Opening up a new area of nature fits in with the Dutch traditions of exploration, trade and the search for knowledge. It also fits in with the tradition of our institution, Natura Artis Magistra. The study of these enormously influential micro-organisms began in the Netherlands. In 1674, Antoni van Leeuwenhoek, discovered the existence of micro-organisms by chance when he looked at a drop of water through a home-made microscope and saw a world of tiny animals. Nowadays, scores of Dutch companies are global players thanks to their work on micro-organisms.

It is generally accepted that 99% of micro-organisms are yet to be discovered. It is very probable that many new uses for microbes will be discovered as a result of the exploration of the world at microscopic level, made possible by enormous technological advances, microscopy, information technology, and biochemistry. Microbiology can help solve global problems, from water purification to developing new ways to cure infectious diseases, such as alternatives to antibiotics. There are microbes which 'eat' plastic and which could be used in waste processing. Algae – another form of micro-life – could be the raw material of the future. Micro-organisms can be used to produce energy, cosmetics, food and bio-plastics. And, with the help of microbes, cow and elephant manure can produce biogas, a sustainable source of energy. The uses are endless.

We have big ambitions. Micropia has been designed as a separate museum. A lot of research has been done and a lot of choices have been made around issues such as design and content. It would be wonderful if the concept could also be introduced to other places in the world so that people in Tokyo or Cape Town could be introduced to the micro-world. Micropia is about a fascinating but, more importantly, an essential part of nature which we must get to know and get a handle on. If we can only widen, deepen and share our understanding of this immense, invisible world, it will open up endless possibilities.

Although there is an awareness of microbiology's enormous potential, there is also an enormous knowledge gap between the scientists and the general public. If there is any generally held view about the invisible micro-world at all, it is a negative one. Unknown is unloved. The idea people have is of filthy life forms that cause you to itch, that live on your skin, on your computer keyboard and even on your toilet seat. We associate bacteria with sickness and rotten food, but both humans and animals could not exist without bacteria.

History looks as though it will repeat itself. When ARTIS was founded in 1838, we actually had little idea about the range of exotic flora and fauna. There was so much that we did not know about the visible natural world. The same is now true of the invisible microscopic natural world. This is dangerous, because the lack of understanding and the preconceptions about microbes (dangerous and dirty) lessen support among the public for the scientific work being done and this has a negative effect on innovation and advances necessary for our planet's survival.

This is why it is all-important to inspire the general public to become interested in microbiology from an early age. ARTIS has 179 years of experience in interpreting complex science for the general public. Micropia puts this expertise at the service of microbiology, to improve its image among the general public. Inspiring school and further-education students to choose science studies and scientific careers is an important part of this. Already, over 100,000 students visit ARTIS each year, from primary-school level to college students attending lectures given by ARTIS professors. Classes on the natural world range from examining animals to astronomy lessons in the ARTIS Planetarium. Soon, learning about the invisible natural world will be added to this. Micropia will claim a unique place in the field of microbiology.

To achieve these goals, Micropia literally allows people to see the invisible. Living microbes (grown in our laboratory) are put on display using specially developed technology. The microbes themselves tell the story of microbiology, helped by award-winning photographer Wim van Egmond's unique pictures, other impressive images, interactive displays and much more. Seeing and experiencing are kept central, with the focus on the (mostly positive) relationship between microbes and the visitors themselves. This brings microbiology startlingly close, while the smart provision of information allows everyone, from the youngest amateur to the oldest expert, to find exactly what they are looking for. One thing is sure: after visiting Micropia, you will never see yourself, or the world, in the same way again.

Meeting place

Despite the large number of Dutch companies and scientists involved in microbiology, there has been no centre for the public, until now. Microbiology is used in a myriad of areas of our society, from hospitals to food production and from art to agriculture. Its potential is enormous. There has been no place up to now where the public involved can come together and meet the general public. Micropia provides this meeting place. Young and old are able to get hands-on experience of the microscopic natural world at the location itself, while events are able to be held in the nearby Ledenlokalen. Micropia is the location for numerous activities, from book presentations to scientific conferences and from themed events to business meetings. There is also an international aspect to our ambitions. Micropia does not want to provide just science for the scientists, but aims to give experts the chance to communicate with lay people. The scientific community is eager to tell the general public its side of the story. Micropia provides scientists and the business community with the ideal location to not just talk about microbiology, but also to actually let people see it. The microbes themselves, a laboratory, microscopes and specially developed presentation techniques mean Micropia will become a unique meeting place where science and technology rubs shoulders with the general public.

Platform

Micropia clearly positions itself not just as a museum but also as a platform, bringing together microbiology's various stakeholders. To begin with, the platform targets the line of development from school pupil, to student, to employee, and provides in-depth, content-rich information through staging conferences and events.

There have to be enough professionals in the market to ensure that the international position of microbiology and the Netherlands grows stronger. That is why the platform targets school pupils and students, viewing them as potential professionals. The first step is to encourage this important group's interest in the invisible micro-world through the museum, its educational courses and the website. They are introduced to the possibilities offered by microbiology, both its uses and the range of job opportunities in the field. Information is also disseminated about practicalities, such as possible courses of study, open days, internships, companies active in the field and job vacancies. That is how school pupils and students are guided step by step towards the study of microbiology and a job in the field.

As well as providing tailor-made information for school and college students, the platform is also a place where anyone who is interested can learn more about microbiology. The platform is an extension of the museum, offering extra information and activities on various levels. There is a special programme, Microbiology, given as part of the ARTIS Academy (ARTIS-Academie), with a series of lectures and activities running through the year. Various conferences are also held at Micropia and its associated locations. Background information, ranging from a blog and news to an A to Z of microbes are available on the www.micropia.nl website. Conferences and events form the platform's third area of focus. As well as the museum itself, Micropia has a number of meeting rooms available, catering for both small and large groups. This makes it possible to use Micropia for conferences and events, allowing participants not just to listen, but to really take part and experience. Events and activities are organised both by ARTIS and third parties, making use of the unique winning combination of Micropia and its various locations. This is how Micropia provides a place where people involved in microbiology can meet and engage and inspire a wide public.

ARTIS MICROPIA

In 1674 Dutch scientist Antoni van Leeuwenhoek was the first to glimpse the rich world of micro-organisms. For the first time in history, this fascinating and important part of nature was opened up for the general public to see. People are Micropia's core business. After a visit to Micropia, you will never see yourself in the same way again.

Visitors to Micropia will get to know something about the enormous quantity of micro-organisms in existence. They will know that they come into contact with them every day. Any feelings of disgust will vanish after being shown how useful micro-organisms are. They will realise too that they would not be alive without micro-organisms, but that micro-organisms could easily live without man. Discover the most powerful life on earth. At Micropia.

How Micropia came about (summary)

The history of Micropia began with the appointment of Haig Balian as director of ARTIS in 2003. He developed a blueprint for the ARTIS of the 21st century. A team was set up in 2005 to develop the Micropia project. The team's strength lay in the diverse backgrounds of the members: exhibition developers, architects, microbiologists, a project manager and a network of professionals as backup. As time went by, the team was enlarged, with new members including a specialist microbe photographer, writers, educationalists, lighting, audio and laboratory technicians, and exhibition builders. Major contributions have been made by scientists, the government and businesses, including the Dutch firm DSM. After twelve and a half years, the idea of a Micropia museum is finally coming to fruition. Hundreds of stories will be told and visitors will be able to get to know what Antoni van Leeuwenhoek called the "animalcules". That was how he described micro-organisms in the 17th century when he first saw them: now we know that 100,000 billion live on a single human body.

How Micropia came about (longer version)

It has taken over twelve years for the idea of Micropia to become a reality and for the museum to open its doors. The process has involved the close collaboration of many parties.

The history of Micropia began when former ARTIS-director Haig Balian was appointed director of ARTIS in 2003. He drew up a wide-ranging blueprint for the ARTIS of the 21st century, encompassing three core principles: more space for animals; more attention to learning about the natural world and a central focus on the ARTIS heritage. Balian's children grew up as the ARTIS blueprint developed. As adolescents, they had their first romances, experienced their first kiss. But what actually happens when we kiss? The mouth is the entrance to the gastrointestinal tract, but is also the habitat of hundreds of thousands of families of bacteria. There are also the complex flora exchanged during a kiss. The idea of Micropia was born.

The early years

The relationship between human life and the natural world lies at the very centre of ARTIS. The story is told through the zoo's animals and plants and you begin to be amazed. You see them, you hear them, you smell them and sometimes you can walk around with them. This idea led to the development of Micropia. At the very centre is the organism and micro-organism and that is where the story begins. The story about its relationship with man, about microbes' special properties, about how we can use them and how they interact with the plants and animals you can see at ARTIS.

In the end, the recurring themes of Micropia are: where microbes fit in on the tree of life; what is special about them; what impact microbes have on individuals and on animals, plants and mankind – now and in the future. The visitor is constantly brought back to the relationship of microbes to his or her own life.

After a general outline was drawn up in 2005, a team was put together to develop the Micropia project. The idea was a museum situated on Artisplein separate from the zoo and botanical gardens and open to everyone. The team began as a small but diverse group, gradually gaining more members. Its strength lay in the diverse backgrounds of the members: exhibition developers, architects, microbiologists, a project manager and a network of professionals as backup. As time went by, new members joined the team including a specialist microbe photographer, writers, educationalists, lighting, audio, and laboratory technicians and exhibition builders.

Feasibility

How do you actually keep microbes? ARTIS has 179 years' experience of keeping animals and plants in a safe and responsible way. But how does that work with bacteria? Or viruses? It was decided that the stories should be told by living organisms as much as possible. When this proved impossible, for example when the organisms in question could cause sickness, a more virtual way of telling the story was chosen. Another bottom line, decided upon together with the experts, was that there would be no physical contact between microbes and the public.

While tackling the issue of how to keep microbes, it was decided that certain principles should be examined and prototypes built. The principles of microbiology which underpinned various displays were tested under working conditions in a research environment, for instance at a university. That was not enough for Micropia, where microbes have to be on display most of the day, seven days a week; and preferably without the need for a laboratory technician to tinker with something every hour.

A collection plan had to be drawn up, just as at every museum. This was time-consuming: the microbes chosen for display had to tell an involved story, had in some cases to be kept alive, had to pose no danger to the public and had to be sufficiently different from the other microbes on show.

A simple laboratory was set up on the top floor of one of the listed Salm cottages at the back of the botanical gardens. Companies, universities and institutions helped to equip the space. Extensive tests were done here to check whether exhibition displays involving specific organisms were feasible. Scientists were regularly called upon to help provide the organisms or to draw up the protocols to keep them alive. This was the decision-making process about how to safely keep various microbes and how to avoid the need for lab technicians to be present at every display.

At the same time, we realised we needed to test the principles governing how we told our stories. Prototypes of a number of innovative media installations were made in collaboration with their designers. The microscope was an essential component. Some organisms, such as colonies of fungi, could be seen with the naked eye but a microscope was indispensable in most other cases. The wonderful thing about a microscope is that its two eyepieces allow you to cut yourself off from the world and dive into the world of microbes. It is a great shame that some visitors are just not up to the job of properly handling this delicate optical equipment. Navigating and fine tuning eyepieces are a necessary part of experiencing and being astonished by what normally is an invisible world.

These experiments resulted in the installation of a 3D viewer attached to the microscope via cameras on the eyepieces. Navigation, a necessary part of exploring the micro-world, has now been made simple. The feeling still remains, however, that you are diving into the invisible world. This method is used in many of Micropia's displays.

Co-operation

It was clear from the very beginning that Micropia could not be developed by a limited project team. The search was on for partners to collaborate on fund-raising, to provide practical know-how and to create the stories and to carry out research. Scientists from most Dutch universities and institutions have been involved, to a greater or lesser degree, in the development of Micropia. Institutions included: the University of Amsterdam, Wageningen University, Leiden University, Utrecht University, Radboud University Nijmegen; VU Amsterdam University; the CBS-KNAW Fungal Biodiversity Centre; Netherlands Organisation for Applied Scientific Research (TNO); Royal Netherlands Institute for Sea Research (NIOZ); Deltares; the Netherlands Genomics Initiative; Royal Netherlands Society for Microbiology (KNVM); and Netherlands Society for Medical Microbiology (NVMM). Many other organisations have helped and supported us: multinational companies, such as DSM which devoted staff to the project; and local institutions, such as the Amsterdam Health Service which provided important practical help with the laboratory and the STD display. The government too helped make the project a reality.

Taking stock

The development of Micropia was also hit by the financial crisis. Originally, the idea was to house Micropia in a specially designed building, but fund-raising results plummeted overnight. We decided to house Micropia in part of de Ledenlokalen, a listed building in need of restoration. We made a virtue of necessity and kept to our core principles and concepts in developing the museum at this location. The building now plays a big part in the Micropia experience.

Just as with the building, we were also forced to take stock regarding content. Over 100 displays had been developed during the years of preparation. Not all of them made it through to the production phase. During the course of 2011, it became clear that decisions would have to be made. Financial considerations, the space available and the feasibility of proposals made hard choices inevitable. The result is a portrayal of the world of microbes. The choices were based on criteria such as beauty, remarkable properties, presentation possibilities, live versus virtual, macro versus micro, importance to people (and to mankind).

Realsation

Micropia has taken over twelve years to develop into the museum which is finally about to open. There will be hundreds of stories and the visitor will be able to get to know the "animalcules" as Antoni van Leeuwenhoek described it in the 17th century. He had just discovered these micro-organisms in sperm, ditch water and tooth plaque using his simple, newfangled microscope. Animalcules which we now know are to be found in their billions on every single human body.

Feike Sijbesma, CEO of Royal DSM, on the importance of micro-organisms

The rest of our life is in the future. That is a good reason to take care of that future. This means taking good care of the climate and making responsible use of our raw materials. In fact, it means taking care of our planet and the people that live here. Today, but also for future generations. New 'worlds' are opening up, new ways of thinking and doing things and there is a willingness to work together to create a sustainable society. Micropia is a unique project launched by ARTIS which will provide the understanding to make a start on this work. DSM was founding innovation partner of the project and is still right behind it.

As I have outlined above, the future is demanding change. Change which will be given form by people with ambition and who have a sense of responsibility. It will be nourished by knowledge of new worlds which we need to learn more about. These worlds will be developed and used in ways we cannot imagine at the moment. The world of micro-organisms is just such a miraculous world – invisible to many, but ever-present, often unnoticed but enormously influential.

We at Royal DSM are familiar with this world. Scientists are now studying the smallest creatures close-up to see how they could play a role in solving the major problems facing society, such as food, raw materials and climate issues. These organisms are already being used in various fields, including in the production of foods, such as cheese, yoghurt, beer and wine, but also in the manufacture of medicine and in the purification of waste water. New uses are constantly being discovered, such as the use of micro-organisms to produce energy and 'second-generation' biofuel from plant waste material. Add to this discoveries being made in unexpected areas. Would someone have been taken seriously three years ago if they had said that enzymes would make possible the large-scale production of biofuel from elephant excrement? It is a fact, though, that this is now being done, in 2014. And it works.

There has always been a gulf between science and the public. It is the same as far as micro-organisms are concerned, even though they are an essential part of nature and can be used in innovative ways to deal with major issues. Think of their impact on the transition from our present linear economy to the circular economy, in which waste is seen as a raw material in order to lighten the burden on our planet. It is a good thing that Micropia will not only lift the veil on the miraculous world of the micro-organisms, but will also provide a link between the scientists and the public, by setting up a wide-ranging educational programme. Primary and secondary school students will not only be able to discover this fascinating world, but will also be introduced to career possibilities in microbiology – from academic scientific research to work aimed at practical use.

It is hard to overestimate the importance of increased microbiological expertise, the introduction of the general public to this wonderful world and practical research into its possible use to man. Microbiology promises us a great deal. Those who have visited Micropia – actually a mini zoo, museum, meeting place and laboratory all in one – will not only be impressed by this major initiative, but will also realise how much we have yet to learn from nature. It will start with being amazed and inspired to learn and get to the bottom of it all: then the ambition to make a difference in a responsible way will come. I am convinced that microbiology and biotechnology will become increasingly important in today's world, providing society with answers to its pressing issues and developments. This can all help achieve the successful transition from the fossil age to the bio-based age. Combining strengths grounded in a shared vision will play an important role in this.

Let us move forward together, in an innovative and sustainable way – to ensure a good future for our children and grandchildren and the generations following them.

Feike Sijbesma, Chairman of the Managing Board of Royal DSM

DSM

Koninklijke DSM N.V. is a Dutch multinational whose science-based work encompasses the fields of health, nutrition and materials. DSM provides innovative solutions that nourish, protect and improve performance in global markets such as those for food and food supplements, personal care, animal feed, medicines, medical materials, automotive, paints, electrotechnology and electronics, life protection, alternative energy and biomaterials. DSM is listed on the NYSE Euronext exchange.

Dutch multinational DSM has played a major role in the realisation of the Micropia project. For years, the company's Principal Scientist Microbiology Jacques Stark was seconded to Micropia for two days a week. A permanent museum displaying living organisms on this scale was a world first, so no stories had been written up and no scenarios or protocols existed for keeping and exhibiting microbes. Creating the right conditions for living micro-organisms was one of Micropia's biggest challenges. A professional laboratory was set up under the auspices of Jacques Stark so that Micropia's science team could test the displays.

The design of Micropia (summary)

"We haven't really put on an exhibition here. It's a laboratory, an experience and a microbe zoo." Mark de Jong is talking, the owner of Amsterdam exhibition architecture agency Kossmann.dejong. The agency talked a lot with both ARTIS and its external advisors about the possibilities and limitations of putting live microbes on display. Kossmann.dejong then tackled the question of how actual exhibits could be used to tell Micropia's stories. The relationship between man and microbe had to remain central.

The microbes are the stars of Micropia. "The microbes are literally in the spotlight because the only light in the space comes from the exhibits themselves," explains Michèl de Vaan, who in his role as spatial designer with Kossmann.dejong was involved with Micropia from the beginning. Mark de Jong takes most pride in the fact that Micropia is genuine, and that lots of the organisms on display are alive. "Creating a virtual world would have been much easier. Duplicating the perfect living conditions for the micro-organisms was the biggest challenge."

In creating the exhibition Kossmann.deJong worked in close collaboration with ART+COM Studios, a Berlin-based media design firm. Their work included the concept design of the media-based exhibits as well as their interaction and hardware design, prototyping and programming. For the 'extremophile' exhibit, about organisms which can survive in the most extreme conditions, ART+COM designed a spectacular 3-D landscape in which you, the visitor, can move around. Kossmann.dejong came up with a solid display that is worked by a mechanical wheel. "A badass organism deserves a badass machine," says ART+COM designer Jussi Ängeslevä.

Lots of Micropia's exhibits are interactive, although the designers were at pains not to make things interactive just for the sake of it. "Interactivity has to add something to the experience and not distract from the content." The ART+COM designers point to the body scan as a successful example of this. The visitor not only works the interface in this exhibit but is also the subject of it.

The soundscape which fills the space is an important unifying factor. Sound designer Peter Flamman makes use of analogue noises to give the visitor the idea that he or she is entering an unknown and amazing world.

The design of Micropia (longer version)

"We haven't really put on an exhibition here. It's a laboratory, an experience and a microbe zoo." Mark de Jong is talking, the owner of Amsterdam exhibition architecture agency Kossmann.dejong. The agency has been working on the design of Micropia since 2006. It has been involved with various museums and is used to making complicated themes accessible to a wide public – employing a mix of media in the process. Micropia, however, provided them with an extra challenge: how do you tell the story of an immense invisible world?

Kossmann.dejong talked a lot with both ARTIS and its external advisors from the scientific and business microbiology worlds about the possibilities and limitations of putting live microbes on display. The agency also tackled the issue of which stories the public would find most relevant and interesting. Next came the question of how actual exhibits could be used to tell the stories about this flourishing but invisible form of life. The relationship between man and microbe had to remain at the heart of the story so that, after a visit to Micropia, you would never be able to look at yourself or the world in the same way again.

Early on in the process, the basic design concept was of an almost theme-park background, with a lot of attention being paid to the space. Gradually, it was decided that the micro-organisms themselves, and not the space, should be centre stage in the exhibition. The microbes are the stars. All the stories are about them.

"The space is restrained, using shades of grey," explains Michèl de Vaan, who in his role as spatial designer with

Kossmann.dejong was involved with Micropia from the beginning. "The microbes are literally in the spotlight because the only light in the space comes from the exhibits themselves."

After the choice had been made to give the (often live) microbes the main role, came the difficult job of deciding which of the billions of varieties of micro-organisms should be chosen. Michèl de Vaan: "The most beautiful micro-organisms don't always have the best stories, and vice versa. We had to find a good balance when choosing our leading players." In the end, varieties were chosen which, taken together, present an interesting image of the micro-world.

Mark de Jong takes most pride in the fact that Micropia is genuine, and that lots of the organisms on display are alive. "Creating a virtual world would have been much easier. Duplicating the perfect living conditions for the micro-organisms was the biggest challenge." Kossmann.dejong thought it really important to strike a balance between information and experience: first capture the visitors' attention and amaze them, so they will want to find out more. "It had to be high-tech, but remain visitor-friendly."

In creating the exhibition Kossmann.deJong worked in close collaboration with ART+COM Studios, a Berlin-based media design firm that has defined the field of spatial communication with new media since the late 80ies, and is internationally renowned for its interactive exhibitions and iconic installations, such as an award-winning kinetic sculpture for Munich's BMW museum. At ART+COM, a team of 25 people were involved in the development of Micropia over the course of seven years. Their work included the concept design of the media-based exhibits as well as their interaction and hardware design, prototyping and programming.

Kossmann.dejong has wide experience in exhibition design and ART+COM in media design. The teams used their particular expertise in achieving a state-of-the-art final result. For the 'extremophile' exhibit, about organisms which can survive in the most extreme conditions, ART+COM designed a spectacular 3-D landscape in which you, the visitor, can move around. Kossmann.dejong came up with a solid display that is worked by a mechanical wheel and looks almost like a bullet-proof bunker. "A badass organism deserves a badass machine," explains ART+COM designer Jussi Ängeslevä. This illustrates how Kossmann.deJong and ART+COM collaborated to create exhibits which are informative and yet remain accessible and fun.

The designers were often confronted by practical problems when developing the displays. "For example, it's very difficult for inexperienced people to operate a microscope and get a sharp picture," says Ängeslevä. That is why ART+COM in dialogue with the involved scientists came up with a 3-D Viewer, a high-end lab tool – a microscope – turned into an easy-to-use device. The visitor simply uses a joystick to move around the image in a similar way to many computer games. It looks like a simple solution, but to get there was not that easy. "A microscope is an expert tool," Ängeslevä points out. "In comparison, the 3-D Viewer deliberately offers less functions, but makes you experience the microbes immediately."

Lots of Micropia's exhibits are interactive, although the designers were at pains not to make things interactive just for the sake of it. "Interactivity has to add something to the experience and not distract from the content." The designers point to the body scan as a successful example of this. The visitor not only works the interface in this exhibit but is also the subject of it.

Kossmann.dejong kept an eye on the complete Micropia experience as each exhibit was developed. The soundscape which fills the space is an important unifying factor. Microbes do not make any sound but sound designer Peter Flamman makes use of analogue noises to give the visitor the idea that he or she is entering an unknown and amazing world. Michèl de Vaan: "The sounds also help visitors to concentrate."

Micropia is set up in two parts: a normally lit ground floor in the 19th-century Ledenlokalen building with its striking spiral staircase, and a darkened upper floor. A two-storey-high wall has LCD screens featuring our star microbes, showing their size in relation to one another. The LCD wall joins the upper and lower floors. The 'black box' building is actually a laboratory turned upside down, not white and sterile but black and solid. The

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space feels as though it has not been designed. This means that the box housing Micropia is not just the neutral background against which the stories play out but also, to use Monath's words, "the blackest space you've ever been in."

Kossmann.dejong: Michèl de Vaan, spatial designer and Mark de Jong, owner

ART+COM: Jussi Ängeslevä, designer & Gert Monath, project leader

Education at Micropia

Micropia's education programme allows us to enter an unknown world. The micro-world is enormous and yet invisible. Microbiology is an integral part of the school curriculum. However, the lack of specialist knowledge among teachers and of equipment in the classroom mean schools find it difficult to cover the subject. Micropia can help. It is important to give students an idea of the micro-world which is set to affect us more and more over the coming years. Micropia's education programme will allow students to discover the micro-world all around them. It will also provide them with an idea of careers in microbiology, both in the practical field and in research. Micropia offers a total education package. This means that teachers and pupils can prepare beforehand for their visit and can take part in an appraisal in class afterwards. Our aim is to give pupils a long-term interest in microbiology and to keep them hooked on this fascinating subject.

Background information about Artisplein and its buildings

Wander around the Artisplein – no ticket required – and the city around you changes. There, you'll make contact with living nature. Time will seem to tick by more slowly. You'll see buildings, people, and city life with new eyes. From a more historical, more complete perspective. Sit down by the pond, and take a little time to observe the stately flamingos, who stand with such poise and ease. Nearby, in the historic aviary, the Dutch polder comes alive: spoonbills and other wading birds live there in a landscape that was here before the city was, and before you were. Sit on the terrace, amidst the 19th-century historic buildings, enjoy the plane trees and the softly murmuring fountain as you soak up the sun. Be inspired by the environment that connects nature, the city and you yourself as an inseparable whole.

Artisplein

The renovated Artisplein is on the corner of Amsterdam's Plantage Kerklaan and Plantage Middenlaan roads. De Ledenlokalen (1870-1893) and Groote Museum (1851-1854), both magnificent listed buildings, are located here. De Ledenlokalen house Micropia, the only museum of its kind, Studio ARTIS, café-restaurant de Plantage, and a number of listed rooms. The buildings have facades facing the street and the park and connect both city and park.

The Water Table (Watertafel) fountain borders the square on the park side. This runs parallel to the Dutch Polder Landscape (Hollandse Polder) aviary, a listed construction, with the world's largest collection of spoonbills (*Platalea leucorodia*). The wading birds give an idea of the habitat provided by the Amsterdam area before it became a busy metropolis. Artisplein is a pleasant place to linger, in the morning and evening sun, next to the Water Table or in the new Plantage café and restaurant. Or from the terrace on the edge of the pond where you can watch the flamingos.

In a major break with the 19th and 20th centuries, Artisplein now has its own separate entrance and is open to everyone. This means that part of the botanical gardens has now been opened up to the city as a public space. Artisplein is designed to show that as well as being a park in the city, the city is now part of the park. Civilisation and nature nourish each other.

Dutch Polder Landscape

The Dutch polder landscape is unique. It has its own regional culture and is a natural symbol of our national identity. This landscape is represented by a large aviary in Artisplein. It is a major part of our history, because Amsterdam would not have existed without the food supply provided by the Dutch polder. We at ARTIS believe it is important to focus on the wealth and beauty of our own natural world in the Netherlands. The aviary has a typically Dutch pollarded willow and ditch. The idea is not to copy the polder landscape but, as it were, to transplant it here. The world's largest collection of spoonbills (*Platalea leucorodia*) is what catches the eye. However, the polder is also home to other Dutch wading birds, such as the Northern lapwing, the black-tailed godwit, the redshank and the pied avocet.

Café-restaurant de Plantage

The people behind café-restaurant Amsterdam and café-restaurant Dauphine opened the new café-restaurant de Plantage, a joint venture with ARTIS, in the restored Ledenlokalen building at the beginning of September 2014. Koen van Brunschot, formerly chef at Hotel de Goudfazant, is in charge of the kitchen.

The restaurant owners involved are enthusiastic about the new restaurant. "The entrance on the Plantage Kerklaan road is classic and imposing. The café has a modern feel and is a good place to meet up, work, study or enjoy an aperitif before going to your table," says Milène Hoving, co-owner of the new café-restaurant de Plantage. "The conservatory is a jewel in the city's crown which no one knew about until recently. In the summer, the doors can be opened and people can enjoy the beautiful view from the wonderful terrace under the old Artisplein plane trees. Our menu is modern and traditional.

The cuisine is influenced by the rich cultures of Southern Europe, North Africa and the Levant region. A modern menu with a cultural mix of dishes.”

Café-restaurant de Plantage is open daily from 9:00 a.m. (in the weekend from 10:00 a.m.) till 1:00 a.m. Further information can be found at www.caferestaurantdeplantage.nl.

Studio ARTIS

Two new, well-equipped television studios have been opened at ARTIS in collaboration with United. The new studios are also part of the restored Ledenlokalen and replace the earlier Studio De Plantage. The grandeur of the historic building will now go hand in hand with the latest high-tech equipment, under the name ARTIS Studio. The two studios offer a special view of Amsterdam’s bustling city life. ARTIS Studio is suitable for talk shows, discussion and informative programmes.

Architecture

How do you restore a major historical monument and yet integrate this with a new modern use? The answer is with respect and through good teamwork between ARTIS Project Management and its advisors.

The architects from the Sprenger von der Lippe practice in Hamburg were, from the very early stages, involved in the development of Micropia and the restoration of de Ledenlokalen. Restoration plans had to deal with the effects of the attack of 27 March 1943, when the wartime resistance bombed the Municipal Register which was housed in de Ledenlokalen during the Nazi occupation. Architect Richard Sprenger saw this as an opportunity rather than a problem. The hole blasted in the building by the explosion became part of the architectural concept.

The new design of de Ledenlokalen has the same grid and structure as the original building and the space feels the same as in the 19th century. The new architecture remains restrained, allowing the historical sections to be properly appreciated. Sprenger: “The new shouldn’t compete with the old”.

The ‘black box’ housing part of Micropia is the most eye-catching of the new additions to the building, which now has three layers. The first layer is the historical part, with its fine delicate lines. The nearer you get to the modern part, the more restrained the lines become. The second layer is the cornice, already more abstract and restrained. The third layer is the minimalist black box. Sprenger thinks that an architect cannot get more abstract than this. The black box is the neutral background against which the rest of the building is allowed to shine. He has ensured that, if you look at it from Artisplein, the historical conservatory is shown off even more beautifully. Sprenger: “It’s just like when you see a beautiful butterfly in a meadow full of flowers. It’s beautiful, but you only really see just how beautiful it is when you put it against a black background.”

The building material for the black box was also an important architectural consideration. Seamless, black aluminium was chosen because it had to be as neutral and elegant as possible. The ribbed structure has a velvety feel. Subtle changes in colour can be glimpsed when the sun shines.

Natura Artis Magistra decided that the surviving 19th-century architecture and interiors of de Ledenlokalen should be restored, with adjustments where necessary to allow them to be used in a new way. The design is restrained to do justice to the building’s historical character. Architect Kees Doornenbal of the Rappange practice in Amsterdam advised on the monumental aspect of the building. Studio Linse Amsterdam was responsible for the interior decoration of the spaces. The restoration of de Ledenlokalen and the plans for its updated use were carried out in close collaboration between ARTIS Project Management and the Cultural Heritage Agency of the Netherlands (Rijksdienst voor het Cultureel Erfgoed), City of Amsterdam Office for Monuments and Archaeology (Bureau Monumenten en Archeologie van de gemeente Amsterdam) and its Building Aesthetics Committee (commissie Welstand).

New use for de Ledenlokalen

In 1870, G.B. Salm designed a major building in an eclectic style on corner of the Plantage Kerklaan and the Plantage Middenlaan streets in Amsterdam: de Ledenlokalen. In 2014, this listed building was restored and, at the same time, upgraded for use in the 21st century. The most impressive and exciting addition is the 'black box' which houses part of the Micropia, the world's only museum of its kind. De Ledenlokalen building has been given back its original functions, that of museum, a place where people come together – the new Plantage café and restaurant – and spaces to be hired out to interested parties.

Television studios will be housed in the South Pavilion (Zuid Paviljoen). The location of Studio ARTIS follows on from a long tradition. Important programmes were broadcast to Dutch living rooms from here.

During the restoration, lots of original details of the building were found still intact. Research into archive material and building and paint records gave a picture of how 19th-century architecture was governed by a hierarchical aesthetic of form, choice of materials and workmanship. This led to the function of the various rooms being decisive in their design.

The Blue Star room (Blauwe Sterrenzaal), on the top floor of the North Pavilion (Noord Paviljoen), was given the wallpaper, fireplace and colour paint it had in 1870. The four rooms underneath were treated to modern wallpaper, designed by artist Pavèl van Houten. Each space was given its own flavour and atmosphere dependent on its use. Nowadays, a tour of de Ledenlokalen shows how harmoniously past and present may make a vital new and coherent ensemble.

Sustainability

Sustainability is one of ARTIS' core objectives and has a bearing on new projects. During renovation work, building insulation was a priority. The single-row brickwork was given a special insulating layer. All the original single-pane windows now have secondary glazing. Micropia's walls and ceilings consist of sandwich panels with highly insulating synthetic material, finished off with a wood veneer. The inside of the 'black box' housing part of Micropia is plastered with small balls made from recycled materials, such as ash and clay, which are filled with air. The binding agent is produced from waste material from the coating industry. The balls insulate the space and dampen noise and are completely recyclable, in keeping with the cradle-to-cradle principle. Electricity is generated by solar panels on the flat roof of the central wing. Rainwater is collected in a large tank under the building and is used to water the plants. The biggest single investment was in thermal energy storage which as well as de Ledenlokalen also serves other parts of ARTIS. In summer, hot water is stored underground next to the jaguar enclosure and in the winter cold water is stored underground next to de Ledenlokalen. The cold water reserves are used to reduce temperatures in the summer and the hot water to increase temperatures in the winter.

Wallpaper by the artist, Pavèl van Houten

It was decided to decorate the walls on the ground floor of the North Pavilion with modern interpretations of 19th-century stylistic principles. Creating new perspectives is an important part of ARTIS' art policy. This involves, amongst other things, offering artists the opportunity to examine the relationship between nature and art to see how it can shape new work in today's world. In the summer of 2013, artist Pavèl van Houten, helped by an army of volunteers, examined two types of trees and one species of grass in ARTIS-Park. Using the data collected, Van Houten created four very different wallpaper patterns. He took to heart the Natura Artis Magistra motto ('nature is the instructor of art and science') and was inspired by both nature and mathematics.

Practical information

Micropia

Artisplein

Plantage Kerklaan 38-40, Amsterdam

+31 900 27 84 796 (55 ct/per call)

www.micropia.nl

Opening times

Sunday - Wednesday

9.00 a.m. – 6.00 p.m.

Thursday - Saturday

9.00 a.m. – 8.00 p.m.

Ticket prices Micropia

Day ticket

0-2 years old free

3-9 years old €13.00 * **

10 years old and above €15.00 **

Students € 7.50 on production of a valid student card

*Micropia is recommended for ages 8 and up. There are special prices for schools.

** €1.00 discount for a Micropia ticket purchased online

Ticket prices Micropia & ARTIS-park (combination ticket)

Day ticket

0-2 years old free

3-9 years old €25.50 * #

>10 years old and above €29.50 *

* €2.00 discount for a combination ticket purchased online

#Micropia is recommended for ages 8 and up. There are special prices for schools.