

Annual Report

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Annual Report 2022

Botanic Garden and Botanical Museum Berlin



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Euphorbia myrsinites subsp. *pontica*

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FOREWORD

The rear part of the Mediterranean House was designed for tree ferns when it was first built (1903–1908) and is still home to them today.

What matters now is to make the political goals and guidelines for species protection a reality and ensure they are successful.

Prof. Thomas Borsch
Director, Botanic Garden Berlin



In 2022, at the 15th UN Biodiversity Conference (CBD COP 15), 196 nations reached agreement on a new international biodiversity convention. Nations set themselves the goal of halting the destruction of nature and turning the tide on biodiversity loss. Meaning that almost a third of the world's land and oceans are to be protected by 2030.

At the European level, too, important steps were made in 2022 towards this change of course: the EU Commission presented the so-called Nature Restoration Law, a central component of the European Green Deal. The aim is to halt the ongoing loss of species that is occurring across Europe and to protect ecosystems so that they remain resilient and make a natural contribution to climate protection.

There is widespread agreement at the political level about the goals and measures that need to be taken, which gives us hope in these challenging times. This development is also a result of the long-standing commitment of civil society and the scientific community. Now it's time to bring these goals and objectives to life and make a success of them.

For such success to be achieved, decisive and knowledge-based action at all levels is needed. That's why we, as BO Berlin, are not only intensifying our collaboration with our partners in the greater Berlin area, in Germany

and internationally, but also strengthening our dialogue with society. We are therefore delighted that great strides are being made in developing the Garden for our visitors. The remodelled Botanical Museum will also set standards here.

I would like to thank my colleagues for the boundless enthusiasm, knowledge and expertise that they bring every day to their work at the Botanic Garden and Botanical Museum Berlin. My gratitude also goes to all donors and sponsors for their support and for making so much more possible. I hope you enjoy reading this report and that it gives you exciting insights into the many and varied endeavours of BO Berlin!

With best wishes,

Berlin, December 2023

GARDEN

GARDEN

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ANNUAL REPORT 2022



**No place for
boredom!**



A discussion on work in the reorganised garden management department.

In August 2021, the garden management department in was restructured. The greenhouses and outdoor beds were divided up into four garden areas, each made up of several zones. To ensure that gardeners and other staff members can work together as smoothly as possible, each of these areas now has its own manager. By September 2022, this new management team was complete, so it was time to discuss this extremely exciting workplace.

Why was the garden management department restructured?

Thorsten Laute: Almost half the staff of the Botanic Garden work in the garden management department. That's around 100 people. Before I took on the job of head of the whole department, I was responsible for the outdoor areas, with 55 members of staff. My colleague in the greenhouses was in charge of another 40 or so staff members. It's simply not possible for just one individual to deal with the needs of all these people. There were tensions and we were losing quite a few workers. That's why we wanted to make changes.

So how did the restructuring take place?

Thorsten Laute: Obviously, we involved all the staff members, and asked people in every zone where the issues were in their particular part of the garden. Workshops were organised on the topic at every level, and we brought in external advisors: for a year, we worked with the strategy and management group Nordlicht Management Consultants to pinpoint the weaknesses in our organisation. It became clear that we needed an additional layer between the management of the whole garden and the individual zones. We now have our four garden area managers working at this important interface.

The garden management team

Henrike Wilke is responsible for garden area 1, "Warm greenhouses". She manages the three zones "Plants of the rainforest and tropical ferns", "Bromeliads, orchids and tropical crop plants" and "Tropical marsh and aquatic plants, Araceae".



Is it by chance that all these posts are now occupied by women?

Thorsten Laute: We don't have any quotas. The choices of people to fill these posts were the result of internal staff development, and one post was also advertised, and went to an external candidate, again a woman. Women were chosen for all of these jobs due to their qualifications, and I think it's a good outcome. Here in the garden management department, we're now almost 50–50 men and women, and I've had very good experiences with mixed teams. When people of different ages, different genders and backgrounds work together, it's often easier to find solutions to any problems that arise.

So what's the job description of a garden area manager?

Henrike Wilke: We're sandwiched, as it were, between different levels. A gardener in a particular zone may inform us of a problem. Perhaps a plant isn't growing well because it's overshadowed or in too sunny a position, poorly ventilated, or because the temperature or humidity levels need to be changed. We then pass this information on to Thorsten Laute and the technical team. And then, to-

gether, we try to optimise the growing conditions, by means of, for example, the automatic climate control system.

Ulrike Lohmann: This close cooperation with the zone gardeners is very important. I trained in tree nursery management, but in my work I have to deal with a vast range of plants: trees and shrubs, annual herbs, even aquatic plants. By myself, I could never deal with the needs of all these plant groups: I need my team of experts. If there's a problem, we sit down together and work on solutions.

Henrike Wilke: But we don't just liaise with other members of the garden management department. Our links with the scientists are just as important. We therefore work closely with the curators, who deal with the scientific aspects of our plant collections. We have many discussions with them, for example if a new plant, which is a focus of research, is to be presented in the public greenhouses. Then we coordinate with the curator, to make sure that the species in question will really be able to grow there.



The gardeners climb to dizzy heights to harvest bananas in the tropical crops greenhouse.



To cultivate the tropical *Victoria cruziana* giant water lily, the gardening team need special knowledge and experience.

It doesn't sound like purely an office job?

Ulrike Lohmann: No, it's not. There's a constant toing and froing between desk work and more practical tasks – and that's a good thing.

Maria Malolepsy: Just sitting in an office wouldn't be at all effective. I noticed this in the winter, when I occasionally worked from home. Obviously, you can deal with some issues over the phone, but it's much better to see, on the spot, what the problem is. If on a cold winter's day the technical systems fail, we have to react straight away. And sometimes colleagues also want to let off steam – and then I'm there for a chat.

Angela Schuhmann: Sometimes we're almost like psychologists or arbitrators. And with the trainees, yet another set of skills is needed,

such as empathy for their learning and life situation as young adults. It's great to see them developing and growing here.

So, you're also responsible for training?

Maria Malolepsy: Yes, and it's great fun. I love it that we have so many incredibly interested trainees. Six of them are working in the greenhouses and six outdoors. The training lasts three years all in all.

Angela Schuhmann: Yes, and it needs to be that long. Outdoors, the conditions in which the plants are growing vary from season to season, and the future gardeners have to adjust to this. For example, the plants have to be handled differently depending on the amount of rainfall. It's therefore good for trainees to have experienced at least two growing seasons, ideally with differing weather conditions.

Maria Malolepsy is the new manager of garden area 2, "Cold greenhouses". This includes the "Succulents" zone, with the impressive cactus collection. A second zone combines plants from the southern hemisphere and subtropical East Asia, with the collection of carnivorous plants. And finally, another zone covers Mediterranean plants and subtropical tree ferns.



Henrike Wilke: Training takes time in the greenhouses too. Our apprentices there are supposed to cover all six zones in the three-year period, from the humid tropics to the Mediterranean area. This gives them a broad range of knowledge.

What's special about the training provided at the Botanic Garden?

Ulrike Lohmann: We're not training people for the private sector. What we're offering is a specialist qualification focused on biodiversity. In the alpine garden or the plant geography section, numerous plant species grow together, rather chaotically – as in nature. And these species are often not at all easy to identify. Our trainees must have a good eye for these varied plants. Ultimately, they have to be able to distinguish between a weed and a plant that should be there. It's different from someone tending only poinsettias in a commercial greenhouse.

Apart from a good eye, what other qualities does someone need to be a trainee in the Botanic Garden?

Maria Malolepsy: For me, the most important thing is to be motivated and interested.

Angela Schuhmann: I agree. We have to select the applicants who really want to work with plants. Sometimes, you can tell if the person is genuinely interested just from the interview. For example, we often bring tools along and ask what they can be used for. Some applicants are very familiar with them and know how they're used and what for.

Henrike Wilke: If, at the interview, the applicants can already recognise a few plants, that too is obviously in their favour. As gardening is physical work, they also need to be fairly physically fit, and they shouldn't be afraid of getting dirty. So that we know how the prospective trainees behave in practice, we invite them along, after the interview, to try out the work for a couple of days. We then get feedback from the gardeners, not only on the work itself but also on how they got on with other members of staff.

Maria Malolepsy: Yes, that's important too. No one can just work on the plants by themselves. As we've already said, gardening is teamwork! Our trainees need to be coopera-

tive, flexible and curious. Anyone keen to learn is in the right place – after the training too, actually.

What about you? Are you too still learning?

Maria Malolepsy: Yes, all the time! That's the great thing about this job. In my work, I'm often in contact with other areas of the Botanic Garden, for example with the people responsible for public relations work and social media. There's always something to learn and develop together. Also, in the process, I'm still learning new things about individual plants, or interesting facts about the history of the Botanic Garden.

Henrike Wilke: As well as this, we're constantly having to react to new challenges. We couldn't do this if we weren't constantly learning. In autumn 2022, energy saving was a real issue for us, too. The question was: can we turn down the temperature in the greenhouses without damaging the plants? It's often a fine line to tread. We therefore took a detailed look at how far we could go with which plants. And finally, we reduced the temperature in all the greenhouses by one or two degrees.

Ulrike Lohmann: Outdoors, too, climate change is forcing us to look for new solutions. Take watering: nowadays, we have to water the plants more sparingly and in a more targeted way than we used to. It requires a different kind of sprinkling.

Maria Malolepsy: But it's not just a question of saving water and energy. We also have to consider the ecological footprint of the materials we use. The use of peat is no longer acceptable. But what can we replace it with? It's often quite difficult to work out the answers to these sorts of questions.

So you don't get bored?

Maria Malolepsy (laughs): Definitely not! I've come from the private sector and thought that the work in the Botanic Garden would be



The Cactus House (seen here from the gallery) is part of the "Cold greenhouses" garden area.

extremely varied. Since I started here in 2022, I've realised that I was quite right! In my area, the work involves many different projects. Sometimes there's a cactus exhibition or a wedding in the Mediterranean House, or art projects or people filming. It's quite unique.

Henrike Wilke: I think we can all confirm that the work is varied. There is no typical routine working day. Something always happens to which we have to react spontaneously. A palm tree may fall down in the tropical greenhouse, or the technical systems fail. I often get to work in the morning and have to shelve my plans for the day straight away.

Angela Schuhmann: Yes, our work is never monotonous or routine. That's not something we need to worry about.

Angela Schuhmann is in charge of garden area 4, "Plant geography", which presents a huge variety of habitats from around the world. These range from steppes and heaths to forests and high mountains. Each of these districts tells its own story and shows the communities of plants that grow there, as in the wild.



What else do you like about your job?

Ulrike Lohmann: Motivated colleagues who are on the ball and have their own ideas!

Maria Malolepsy: I'd agree with that. I also really enjoy working with the gardeners. They're professionals who love plants and are passionate in how they care for them. You get the feeling that they all find the work fun – and that affects the working atmosphere.

Henrike Wilke: I also find that there's a good team spirit. I can still remember 2003, when the Garden was threatened with closure. We organised an open day, and all the gardeners presented something. One showed people how to sow tropical ferns, another explained how seeds are collected from various plants. We all got stuck in and it was a real success, with the public and politically.

Fortunately, the effort was worth it, and the Botanic Garden is still up and running. What would you wish for the future of the Garden?

Maria Malolepsy: I wish that we could convey the stories behind the plants even better. We have so many exciting tales to tell!

Henrike Wilke: In the outdoor areas, as part of the building work to improve the Garden's tourist infrastructure, a new information system for visitors will soon be introduced. It would be great if in the greenhouses, too, we could get across even more interesting information on the plants, their history and the vegetation zones we're presenting there.

Angela Schuhmann: And we need more staff! We're just not able to care properly for all 43 hectares. Basically, the area has remained the same for a hundred years, but we have far fewer staff than before – and what's more, in the coming years, many of our colleagues will be retiring. For the gardening work, though, we need experienced staff, because caring for the living collection with its thousands of species is quite different from producing ornamental plants in a commercial business, where the focus is on large quantities of a few species. This means that if we're to pass on our specific knowledge, we have to be contin-

uously taking on new gardening staff. That's the only way to ensure that new colleagues are properly integrated.

Ulrike Lohmann: What I wish for the Garden is a secure future – and that it can be valued by the public and by the political authorities. Given the dramatic loss of species that we're seeing, there's real pressure to act and our knowledge is more in demand than ever. But with our current resources, we can't do prop-

erly all that we need to do. A botanic garden combines knowledge and relaxation, so is the perfect place to enthuse people about preserving their natural environment.

Thorsten Laute is the director of the whole garden management department. He and the four garden area managers make up the management team, together with the TIO (technology, infrastructure and organisation) staff office and the garden landscaping and logistics team.

Ulrike Lohmann is responsible for garden area 3, "Arboretum and propagation", a particularly diverse area. It includes the trees and shrubs in the arboretum and the in-house nursery for cultivating all the outdoor trees and shrubs, as well as the system of herbaceous plants and the medicinal plants garden, the aquatic and marsh plants garden with the moss section, and the alpine garden growing plants for the plant geography section. And finally, this area also includes the special conservation and research plants, cultivated for these purposes.

The garden management team, finally, includes two more staff members. These are **Thomas Borowka**, from the staff office for technology, infrastructure and organisation, responsible for supervising the extensive building and infrastructure work in the garden, and **Matthias Grunicke**, head of the garden landscaping and logistics department, who, with his team, is in charge of external maintenance of the ornamental gardens, as well as upkeep and logistics throughout the garden.

COLLECTIONS

Dried treasures

COLLECTIONS

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In Germany's largest herbarium in Berlin, researchers are trying to find answers to a host of questions

The pine tree looks anything but healthy. First the tips of its shoots turned pale green, then they went completely brown. A glance at the base of its dead needles immediately reveals the cause of the symptoms: the fruiting bodies of a fungus called *Sphaeropsis sapinea* are visible as small, dark dots. This pathogen causes the so-called Diplodia tip blight, which can become a real problem for pine trees. "The brown needles do not photosynthesise, so they can no longer generate energy", says Dr Robert Lücking from the Botanic Garden Berlin. As curator of cryptogams, he is responsible, among other things, for fungi, lichens and mosses. Since March 2023 he has been head of the Department of Evolution and Biodiversity. "In smaller trees, the infection can lead to death", explains the fungi expert.

Reason enough for scientists to investigate the disease more thoroughly. Especially as it appears to be on the rise: since around the 1990s, more and more trees in Germany have been battling the heat-loving fungus, which is considered one of the beneficiaries of climate change. It has a particularly easy ride if its victims are already weakened by heat, drought, hail or other stress factors. But which tree species are particularly at risk? How long has the pathogen been active in Germany, and how widespread is it? And will it cause more damage in the future? A research team from the Freie Universität (FU) Berlin and the Botanic Garden has found some of the answers to all of these questions in herbaria.



Sarah Bollendorf checks a freshly mounted herbarium specimen.

This example shows how valuable such collections of dried plants, fungi and algae are for investigating current research questions. As the largest of its kind in Germany, the herbarium at the Botanic Garden Berlin alone contains around four million specimens. Whether it's the consequences of climate change or the evolution of certain plant groups, the protection of biodiversity or the history of botany: this treasure trove of plant knowledge can provide researchers with answers to a whole range of questions.



Host and abiotic constraints on the distribution of the pine fungal pathogen *Sphaeropsis sapinea* (= *Diplodia sapinea*)



Juraj Paule at work in the herbarium.

The herbarium pioneers could hardly have imagined such a wealth of scientific possibilities when they assembled the first collections in the seventeenth and eighteenth centuries. "Back then, botanists often travelled to unexplored areas and brought back many new species with them", explains curator Dr Juraj Paule, who with his team is responsible for the Berlin herbarium. What then started as a private passion for collecting later developed into an institutional one. The botanists needed enough comparative material to be able to classify the abundance of unknown plants into genera and families.

This type of taxonomic research continues to play an important role today. After all, numerous new species are still being discovered, and the interrelationships between the already known species still hold many mysteries. Which is why individual genera or even entire plant families sometimes have to be reorganised – an important responsibility for Sven Bernhard, Sarah Bollendorf, Peter Hein, Katharina Rabe and the experienced team of herbarium experts. Herbaria are indispensable sources of information for researching biodiversity. They also store the valuable type specimens that were used to describe particular species. Anyone who discovers new plants has to use this comparative material.

The possible uses of these valuable research resources are far from being exhausted. "Nowadays, herbaria are viewed as more complex biological archives", says Juraj Paule. The specimens stored in them can be analysed not only optically but also using modern methods of molecular biology. These make it possible to obtain DNA even from dried plants that are centuries old. "Museomics" is the name given to this genetic search for clues, which has already elicited a wide variety of new insights from old museum specimens. This is also true in the case of tip blight in pine trees.

Together with colleagues, Dr Julien Roy from the FU Berlin scoured Germany for the pathogen that causes this disease. The research group scrutinised freshly collected shoot tips of various pine species as well as specimens from several herbaria. The problem is that not every infected tree shows externally visible symptoms. Which is why molecular biological studies were necessary. "In such cases, you can analyse the entire genome contained in a sample", explains Robert Lücking. To be sure, this DNA comes from different organisms. But there are now reliable methods that can be used to separate out the components of the genetic cocktail and assign them to the relevant species.



Corinna Kroll mounts a herbarium specimen.

In fact, this same method also worked when it came to hunting down the fungus. The study shows that in Germany the pathogen most often attacks the Scots pine, which was probably its original host. Before 1910 it appears to have been relatively rare. It is now more common, though, especially at lower altitudes. But it has not yet been detected at altitudes above 1,000 metres – it may simply be too cold for it there. However, the research team believes it is entirely possible that it could spread further as a result of climate change and also infect a larger range of pine species.

Of course, such pathogens are not the only organisms whose past and future can be illuminated by herbaria. These botanical archives are also of interest for nature conservation because they can be used to track biodiversity loss: Which plants were present in a certain region in previous centuries? Which of these have become rare or have completely disappeared? And what were the reasons for that? Such knowledge can help to determine which species should be reintroduced as part of nature conservation projects. What's more, genetic analyses can be used to find out which genetic variants of a species are best suited to a particular region.

What's also exciting in this regard is the question of the future prospects of a species. Herbaria can similarly provide information on this. "The specimens reveal the conditions under which the individual plants grew in the past and where they occur today", explains Juraj Paule. Anyone who evaluates a lot of this kind of data can deduce the requirements of the given species: what temperatures and precipitation conditions it needs, what type of soil and how much light. On the basis of these individual factors, computer models can determine the ecological niche in which the particular species exists. And a simulation is then produced showing where in the world the species is most likely to find favourable growth conditions in the future.

But herbaria have much else to reveal, and not only about the collection objects themselves. Valuable answers to many other questions can also be found in these archives of biological diversity. "For example, if there is still a bit of substrate clinging to the roots of a dried plant, you can examine the DNA of the microorganisms it contains and assign them to the relevant species", says Juraj Paule. "That way you build up a picture of the community in which the plant grew."



Peter Hein checks an item from the alcohol collection.

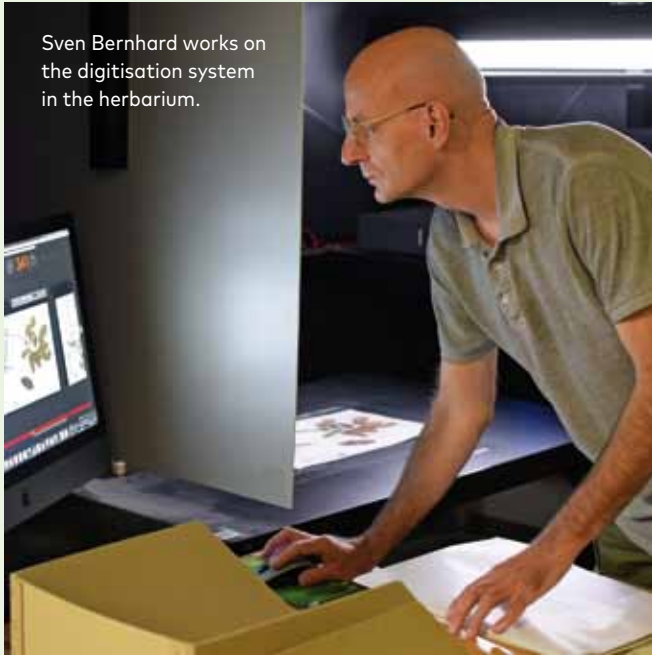
Just a few decades ago, scientists would hardly have dared to dream of such possibilities. The botanical treasures stored in the herbarium in Berlin are more valuable than ever for research. That's why the Botanic Garden works tirelessly to further expand this resource. "There will continue to be collecting trips to bring plants from different regions of the world to Berlin", says Juraj Paule. The Cuba and Caucasus collections, for example, are going to be augmented.

In addition to this, precious collections are regularly donated to the herbarium in Berlin. One such example is the extensive moss collection of Jan-Peter Frahm, one of the most important German moss researchers, with around 80,000 specimens, which Katharina Rabe and Robert Lücking have now almost completely integrated into the herbarium.

There is also a large pool of yet-to-be processed specimens. These are being processed by Sarah Bollendorff, Peter Hein and Katharina Rabe and entered into the herbarium database. Under the guidance of Corinna Kroll, the dried plants are carefully mounted and finally end up with Sven Bernhard for digitisation.

Especially when photographing the specimens, the goal is to make the existing treasures more usable. "We aim to digitise the entire herbarium if possible", says Juraj Paule. Given that there are approximately four million specimens, this is a mammoth project. But it will make botanical research much easier. Around 100 scientists still travel to Berlin every year to work in the herbarium, plus there are about 300 requests from researchers who want to borrow specimens. If every dried plant with all the data and high-resolution images were to be digitised and freely available on the internet, some of these visits would be unnecessary.

The technology required for this already exists. During the quest for the pathogen that causes pine tip blight, the working group led by Julien Roy and Robert Lücking saw for themselves how well modern cameras can capture even small details. "You can see the symptoms of the disease just as clearly in the pictures as you can with the binocular microscope in the collection", says Robert Lücking. If all herbarium specimens from pine trees in Germany or even throughout Europe were digitised, countless images could be searched



Sven Bernhard works on the digitisation system in the herbarium.

150 specimens



on average can be processed every day with the modern digitisation system.

for traces of the pathogen using artificial intelligence (AI). This would provide a huge data set that researchers could use to model current and future infestations very well. This also applies to other pathogens affecting a wide variety of plant species.

"The use of artificial intelligence will offer us completely new opportunities in biodiversity research", says Juraj Paule. There are already apps that can automatically recognise plant species based on leaf shapes and other characteristics. How well this works depends on how intensively the electronic helpers have been trained. Training the AI requires good-quality images that have already been analysed and identified (by humans).

The digitisation of the Berlin herbarium is still in its infancy. Only around 15 per cent of the collection objects have so far been done. Using the modern digitisation system that the herbarium has had for five years, Sven Bern-

hard and his colleagues can process an average of 150 specimens every day. What's really needed to speed things up is more money and staff.

But it's already clear that it's well worth the effort. "When digitising, you have to handle each specimen individually", says Juraj Paule. "And sometimes you experience a real aha moment." During the digitisation process, the herbarium team has found around 250 type specimens of begonias and 180 more of jewelweeds of the genus *Impatiens*, which had been slumbering unnoticed on the shelves for decades. These are now being reviewed and then put online so that botanical researchers can benefit from them. Who knows what these plants will reveal. "You can never say in advance which doors new methods might allow us to open", says Juraj Paule. "The last thirty years have shown that very clearly."

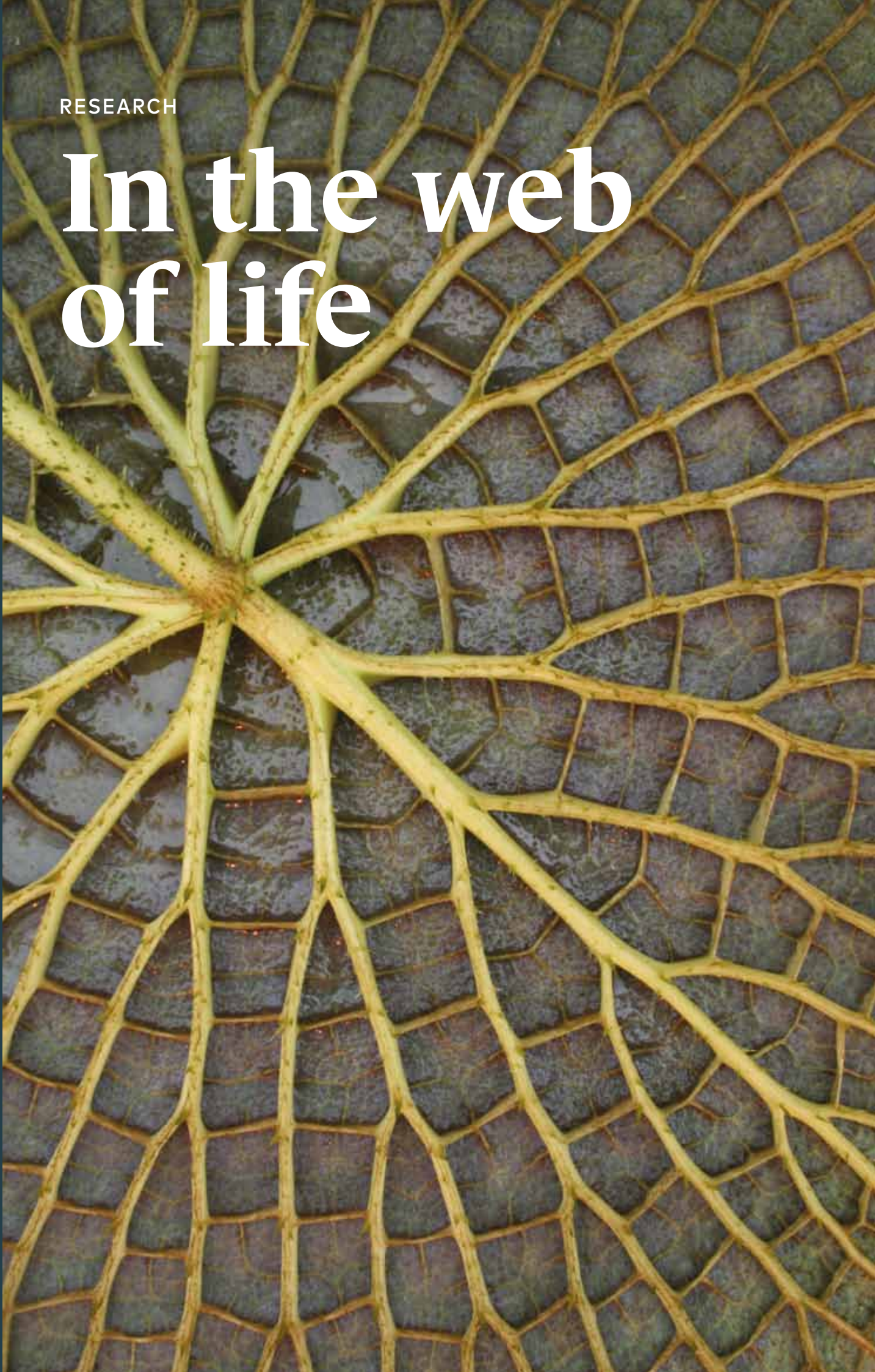
RESEARCH

In the web of life

RESEARCH

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Biodiversity informatics helps to link research data and make it more usable.

“Everything is connected to everything else.” Alexander von Humboldt came to this realisation more than 200 years ago. For the explorer, nature wasn’t something one-dimensional that could be understood just by taking a quick look and scratching the surface a bit. In his opinion, scientists needed rather to “look at flora, fauna and rock strata globally and in an interconnected way”.

This motto is more relevant today than ever. Botanists around the world are working to create the widest possible range of connections – between data and research results as well as between people and institutions. “We have to collaborate globally if we are to meet the challenges of the future”, says Dr Eva Häffner, who works as a scientific coordinator at the Botanic Garden Berlin.

A key part of her work is making the necessary contacts. This often involves joint projects with other institutions in Germany, Europe and the wider world that are concerned with biodiversity research. “We are working together to make the wealth of objects and information in our scientific collections more accessible”, says Eva Häffner.

This is a truly Herculean task. After all, Germany has the third-largest herbaria inventory in the world, with around 23 million dried plants, fungi and algae in more than 70 collections waiting for scientific analysis.

But most of them are still in a kind of analogue Sleeping Beauty slumber. If you want to use them, you either have to head off to the particular collections themselves or borrow the objects you’re interested in – a costly and time-consuming undertaking.

“For many research questions, specimens must be quickly and comprehensively accessible”, explains Eva Häffner. This is only possible digitally. “In virtual collections, information can be found much more quickly and in a bundled form”, says the expert. And the more high-quality data researchers have at their disposal, the more reliable conclusions they will be able to draw. For example, when it comes to which species are particularly at risk in a certain area and how they can best be protected. “We need an infrastructure that can provide information about the world’s biodiversity”, concludes Eva Häffner.

But while countries like France and the Netherlands have already made great progress in digitising their collections, Germany is lagging behind. Just 13 percent of the herbarium specimens available nationwide have so far been prepared in the necessary way. “Remedying that would actually be a major national project for which the federal government, individual states and various departments would need to work in concert”, says the scientific coordinator. So far, there has been no national digitisation offensive. But Germany’s institutions are laying the groundwork for this future-oriented topic with their initiatives and their own resources.



<https://herbarium.gbif.de>



One result of their efforts is the Virtual Herbarium Germany, which went online in May 2022. The digital treasures of more than 20 German herbaria are freely accessible on the website. Anyone interested can browse around 1.1 million specimens and 400,000 images and view the exact find-spots on a digital world map. If you feel like it, you can go on a botanical research trip in the footsteps of Alexander von Humboldt. Or look at the original plants that the Berlin botanist Carl Ludwig Willdenow collected at the turn of the eighteenth and nineteenth centuries.

The technical platform that makes all of this possible comes from Berlin – and that’s no coincidence. Biodiversity informatics has been one of the scientific flagships of the Botanic Garden for years. In 2021, the institution even set up its own Center for Biodiversity

Informatics and Collection Data Integration (ZBS). The job of the ZBS’s team of around 20 experts from the fields of computer science and biology is to make computers understand the diversity of life. How should the data be obtained, and what standards should it meet? How can it be linked? And what is the best way for those interested to access it? The Berlin group is leading the way in answering such questions. So it is hardly surprising that their data services are in demand worldwide and that they are working on numerous inter-disciplinary and cross-institutional projects.

The ZBS coordinates the technical development of the German hub of the open data platform Global Biodiversity Information Facility (GBIF). This international network has set itself the goal of making data about



<https://herbonauten.de>

the Earth's biodiversity freely and permanently available on the internet. The Virtual Herbarium Germany was also born out of a collaboration between GBIF and the Botanic Garden Berlin.

Scientists have high hopes for such online platforms. "One of their advantages is they can be accessed not only by people but also by machines from all over the world", says ZBS head Anton Güntsch. This enables the use of artificial intelligence: computers can automatically search the mass of data for plants with certain characteristics. And the larger the pool in which they can fish, the more meaningful the analysis results will be.

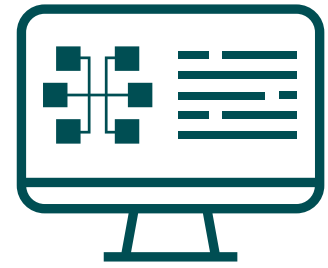
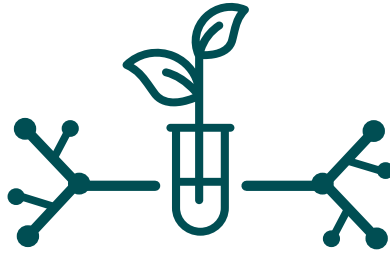
This applies to almost all questions that the herbaria can help answer. Will climate change push arnica, known as a medicinal plant, back to cooler mountain regions? Where and how quickly can invasive species such as narrow-leaved ragwort, which was introduced with wool imports, gain a foothold? And what about the diversity of fungi in Colombia? "If you want to investigate something like that, the Berlin herbarium alone won't help you", says Anton Güntsch. As comprehensive and impressive as the collection is, it can only show a small segment of the overall picture. "In order to get a larger overview, you would ideally have to be able to access all of the data that exists worldwide", says the computer scientist. Although this goal still lies in the future, the joint online collection of German herbaria is a first step towards it.

Over the next few years, this virtual collection will be further expanded. The Botanic Garden Berlin is committed to making its approximately four million specimens fully available online by 2030. Plant enthusiasts can also



Dr Eva Häffner works with colleagues from across Europe on the networking of natural science collections.

help out. The ZBS invites anyone who's interested to explore the world of dried plants, algae and fungi as "herbonauts". You can log into the website and work on specimens from the Berlin herbarium that have been scanned in. So far, the main focus has been on deciphering the labels on old finds and entering the relevant information into databases. "This project is a huge success", Anton Güntsch is happy to say. Around 600 herbonauts have so far been involved in a total of 44 "missions" on various topics – and have done such good work that this kind of citizen science is set to be broadened. "We are thinking about new missions in which participants might record the characteristics of plants", explains the ZBS head.



But the specimens themselves are not the be-all and end-all. The virtual platforms become even more meaningful if they're able to offer additional information about each dried find. Even within the Botanic Garden, the herbarium specimens can be linked to the corresponding plants from the living collection, to the available DNA samples and to multimedia objects. And if you also include other, external, sources of information, the whole thing becomes even more interesting – and more complex. “The dream is an IT system in which you can see everything that is associated with a particular specimen”, says Anton Güntsch.

But how can this best be achieved? This question is also one of the ZBS's research priorities. The team coordinates an international project called Botany Pilot. On this platform you can enter the names of botanists whose research and collecting activities you are interested in. The computer not only then tells you which specimens that particular person has collected and where they are stored. It also links to lots of other information, from biographies to letters and scientific publications. “Further down the line, we want to offer other entry options in addition to the

name”, says Anton Güntsch. So that it might be possible to filter the data according to geographical information or specific habitats. “You could then retrieve all the information about, say, the raised bogs in a certain area”, explains the expert.

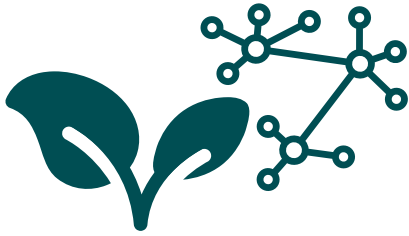
But even with all of this, the limits of knowledge and data linkage have not yet been reached. “The herbaria are particularly suitable trailblazers for digitisation”, says Eva Häffner. After all, they mainly store flat objects that can be easily photographed and analysed using artificial intelligence.

Very much in the spirit of Humboldt, an initiative of German herbaria – coordinated by the Botanic Garden Berlin – is committed to creating a common area of knowledge that forms the basis for answering a wide range of research questions and an important component for international data networks such as DiSSCo and GBIF (see also news-in-brief article on p. 34).

But the wholesale digitisation of German botany is also set to play a key role across disciplines. As part of the OSIRIS (“Open Science Information- and Research Infra-



<https://services.bgbm.org/botanypilot>



structure") initiative launched in 2022, the collections of the Leibniz Association and its university partners are seeking to create a common, interdisciplinary knowledge base. What makes OSIRIS special is that, in addition to natural sciences, it also includes technical and cultural studies collections. "This is particularly exciting because it enables us to investigate completely new questions", says Eva Häffner. The history of land use and its consequences, for instance. Such complex topics have scientific as well as cultural and technical facets that can be illuminated much better than before with a common research platform. By using open data interfaces, the botany initiative can develop its full potential in OSIRIS.

Taken together, Germany's research collections contain more than 150 million objects that could be made virtually accessible to science. These efforts are also set to be integrated into similar projects at European and global levels. The digital knowledge pool is growing. And this offers opportunities that Alexander von Humboldt, as a pioneer of scientific networking, would probably never have dared to dream of. It's not just about satisfying the curiosity of researchers. After



Anton Güntsch heads the Center for Biodiversity Informatics and Collection Data Integration (ZBS).

all, nature also provides materials, active ingredients and a whole host of solutions to man-made problems. You just have to find them. "There is so much lying dormant in the collections that can also benefit us socially and economically", says Eva Häffner. "We cannot afford not to use this potential."

The year in review

2022

Jan

Feb

Mar

Apr

May

Jun

April

Launch of the Citizen Science White Paper: over 100 participants from politics, science and civil society celebrated the launch of the Citizen Science Strategy 2030 for Germany in the Botanic Garden. In the afternoon, visitors were able to learn about citizen science projects in interactive formats at the Citizen Science Festival. These included the BO Berlin projects Die Herbonauten ("The Herbonauts") and Pflanze KlimaKultur! ("Plant Climate-Culture!")



As in 2021, an online girls' day took place in the Dahlem Seed Bank as part of the "Wild Plant Conservation in Germany" (WIPs-De) project. Ahead of the day, fourteen girls from all over Germany had germinated bean seeds, which they now examined together. The participants also learned about the techniques used to prepare and store seeds from wild plants in the seed bank. And about how these seeds are used to reintroduce endangered wild plants to their natural habitat.

Greenhouses opened again without restrictions: after just over two years, visitors were able to visit the greenhouses without timed entry tickets.



May

Launch of the Virtual Herbarium Germany: The treasures of 22 major German herbaria were made accessible together online for the first time. The online portal is curated by the Botanic Garden Berlin, which also developed the software behind the portal together with the international open data platform Global Biodiversity Information Facility (GBIF).



June

Fungi and lichen tour for the Langer Tag der Stadtnatur ("Long Day of Urban Nature"): In addition to almost 20,000 plant species, the Botanic Garden is also home to numerous species of fungi and lichens. On 12 June, under the expert guidance of Hansjörg Beyer (mycologist) and Dr Robert Lücking (curator of cryptogams), visitors learned interesting facts about the fascinating world of these organisms.



MuseumsLab hosted by BO Berlin: TheMuseumsLab is a pioneering programme for joint learning and knowledge exchange for young African and European museum professionals. In June, over 50 of the programme's fellows from Africa and Europe came to the Botanic Berlin Garden for workshops and discussions (see news-in-brief article on p. 40).



Jul

July

Botanical Night: Under the banner "The Miracle of Botania", around 13,000 guests enjoyed a programme of art, acrobatics, music and performances in the magically illuminated garden. This was the first year that the event had come under the patronage of the district mayor of Steglitz-Zehlendorf, Maren Schellenberg.



Aug

August



Svalbard expedition: How is climate change altering life in the Arctic? Answers to this question can be provided by microscopic algae that a research team of Berlin botanists and marine biologists collected on a three-week expedition in the Arctic. The team included the Botanic Garden's botanist and diatom expert Dr Jonas Zimmermann and doctoral student Katherina Schimani.

Sep

September

BfN "Garden Talk" at BO Berlin: On 22 September, under the question "Does climate protection require species protection?" Sabine Riewenherm, president of the Federal Agency for Nature Conservation (BfN), discussed the connection between species and climate protection with Director Thomas Borsch and other experts. The event at BO Berlin was part of a series of talks that the BfN initiated in 2022 to highlight the connections between biodiversity and climate at a national level and to illuminate them from different perspectives.



Oct



Orchid Show returns to BO Berlin: Bright moth orchids, unusual cattleyas, exotic rarities and miniature orchids – from 23 to 25 September the Berlin branch of the German Orchid Society showed fascinating natural and cultivated varieties for the first time in four years.

Nov

November

From 16 November 2022 to 15 January 2023, the "Christmas Garden Berlin" opened its doors for its sixth season. After dark, over 85,000 visitors experienced the impressive light installations and soundscapes at over 30 glowing stations throughout the garden. Since its premiere, continuous improvements have been made to the energy efficiency of this major event; 95 per cent of the illuminations now use LED technology.



Dec

December

Start of the TETTRIs project: The acronym TETTRIs stands for Transforming European Taxonomy through Training, Research and Innovations, an innovative joint project of 17 European institutions, including the Botanic Garden Berlin. The project aims to make expertise on the biodiversity of organisms such as plants, insects and mammals accessible to and usable by societal actors and is funded by the EU until May 2026 (see news-in-brief article on p. 34).



Architecture with a pull effect

The Botanical Museum Berlin is being thoroughly revamped and modernised

"Habt Ehrfurcht vor den Pflanzen, denn alles lebt durch sie" (Revere plants, for everything lives through them). Not for nothing is this quotation from Johann Wolfgang von Goethe displayed on the façade of the Botanical Museum Berlin. "In the future, our visitors should experience the truth of this sentence even more vividly", says Susanne Feldmann, head of the Museum and Exhibitions unit at the Botanic Garden Berlin. However, a little patience will be needed first, as the museum is currently closed; since 2022, extensive building work has been underway. A glimpse behind the scenes, though, already gives an idea of what future visitors can expect.

special and permanent exhibitions. Quite a few jobs, then, needed to be done. In addition, the building could not meet all the requirements linked to a contemporary museum. "For example", says Susanne Feldmann, "there was no barrier-free access to the exhibition spaces. And it wasn't so easy to find your way around the museum."

The Berlin architecture firms Studio Qwertz and Heneghan Peng Architects therefore developed a design concept to remedy these problems. The rebuild is being financed, via the "Joint Scheme for the Improvement of Region-

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The permanent exhibition at the Botanical Museum Berlin has always offered an exciting journey into the world of botany. Its origins date back to 1963, when museums were run on different principles from today. The interested visitor could learn a great deal – about the various plant groups, evolution, plant geography or the history of botany. "In the future", explains Susanne Feldmann, "we hope to reach a broader public". A visit to the new exhibition should, therefore, not just convey knowledge but should also provide a real visitor experience.

As well as the exhibition, the museum building itself was also showing signs of age. It dates from the beginning of the twentieth century, but the repair work done in the 1950s had considerably altered the original character of the building. In the following decades, only some parts of the museum were renovated, and there was no spatial separation between



View through the almost five-metre-high archway into the Engler Hall.

al Economic Structures" (GRW), by the federal authorities and the State of Berlin. The aim of the building work is to help improve Berlin's tourist infrastructure. Ultimately, the garden and museum are not just significant scientific institutions, but are also tourist attractions. "We want to create a living space here that can attract people in", explains the leading architect, Malte Looff from Studio Qwertz, to summarise the goal of the building project.

The plan is not at all to carry out a complete overhaul – on the contrary, respect for the historic building is top of the list of project



When they opened up the ceiling of the Garden Hall, the building team revealed decorative features from the past.

principles. Many of the old design features are to be kept, and some will even be highlighted or revealed for the first time. The challenge is to combine this architectural heritage with new components – in such a way as to create a harmonious whole.

Anyone interested will be able to judge the success of this venture right at the beginning of their visit. The concept seeks to use architecture to create a sort of pull effect, to attract people in, from as far away, it is hoped, as the bus stop on Königin-Luise-Platz. People getting off the bus should be encouraged into the museum, via the easy-to-find and barrier-free entrance to the building.

"A newly designed entrance area welcomes the public in and steers them in the right direction", says Susanne Feldmann. Visitors can buy their ticket at a modern counter and can stow their bags in the lockers opposite. Other than this, the so-called entrance hall will look very similar to just after it was built. Experts have even analysed the original colours used. It will be a bright and welcoming space, painted in shades of off-white.

From the entrance hall, the public can proceed through the new opening into the Engler Hall. This will take them through an impressive archway that had been hidden for decades. "We first had to uncover it, which gave us a real surprise", recalls Malte Looff. Having studied old documents, the building team had expected an opening around four metres high. But when the workmen removed the plaster, a five-metre-high archway was revealed. The

staircases and doors had again to be re-planned, but it was worth it: the access to the Engler Hall will now be even more impressive than originally hoped for, which should further enhance the architectural pull effect.

In the hall itself, an unusual combination of old and new features awaits visitors. At its heart is the modern raw steel staircase, leading upwards like a monumental sculpture. Together with the walls, which have been kept relatively dark, and the rosemary-coloured linoleum flooring, it will give this room a very special atmosphere. From this exciting space, visitors move on to the actual exhibition area, with sections for permanent and temporary displays.

People entering the building not through the main entrance, but from the new visitor centre via the courtyard garden, will also find their way more easily than before. The first stop is the Garden Hall, where the builders made some more surprising discoveries. The work on the ceiling uncovered decorative features. The plans for this room therefore also had to be altered, so that this decorative detail could still be seen after the building work had been completed. From the Garden Hall, visitors can proceed to the entrance hall, from where the route continues as described above.

Blind visitors and those with impaired vision will also find it far easier to find their way around. There will be a guidance system on the floor, which can be felt by the person's white cane: plastic ridges indicate the way through the rooms, and small bumps show where it is worth spending a bit more time. The stairs are also equipped with special markings, and the handrail is illuminated, with raised writing.

It will be some time before all these new and historic features can be viewed by the public. The building work is still in its initial stages, and the museum is due to reopen in 2025. The future strategy for the Botanic Garden will then also be applied through the Museum. "We want people to again have greater access to nature", says Susanne Feldmann, "and we hope that our exhibitions can help achieve this".

Mission philodendron

Botanists have brought back valuable new research material from an adventurous collecting trip to Central America

Sweltering climbs on remote mountain peaks. Boat rides along lonely rainforest rivers, leading into uncharted green territory. Hikes through impassable rainforest, where a machete is needed to open a path. All this sounds like a travel journal that could have been written by Alexander von Humboldt: adventurous and rather old-fashioned. But impressions can be misleading. There has been huge progress in botanical research since the famous naturalist set sail for America in 1799. But some of the methods used back then are still surprisingly up to date. Now as then, moreover, biologists do not spend all their time at their desks or in the lab. The lucky ones can still set off to collect plants in inaccessible and largely unresearched regions.

In 2022, the curator of the tropical and subtropical living collection at the Botanic Garden Berlin experienced again just how exciting this can be. From October to December, Dr Nils Köster travelled through Costa Rica and Panama. "Researchers rarely get this sort of opportunity", says the biologist. The expedi-

tion was only possible thanks to the support provided by the Association of Friends of the Botanic Garden and Botanical Museum, and with funding and organisational support from our cooperation partners at the University of Costa Rica's Lankester Botanical Garden, the University of Panama, and the Panamanian Coiba Scientific Station – Coiba AIP.

With this support, Nils Köster, together with PhD students Marco Cedeño Fonseca from Costa Rica and Orlando Ortiz Castillo from Panama, could put their ambitious plan into action. Their mission was to discover more about the secrets of philodendrons, also popular house plants. These plants first appeared around 30 million years ago in South America. When the land bridge formed between the south and the north of the continent, the route to Central America opened up. Over time, the genus developed there in a huge variety of forms. It is therefore the perfect place to gain greater understanding of this evolutionary history, and of the interrelationships between the individual species.



Orlando Ortiz, Nils Köster und Marco Cedeño with *Philodendron gigas* in Panama.



Every evening, the biologists prepared herbarium specimens and DNA samples in the field.



Species-rich cloud forest on Cerro Piña in the Darién region, Panama.

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In their hunt for as many *Philodendron* species as possible, the three researchers travelled through many of Costa Rica's national parks and smaller protected areas, and even journeyed as far as the remote Darién national park on the border between Panama and Colombia. For Nils Köster, this extremely species-rich area was particularly fascinating, as it is a real *Philodendron* hot spot. "In this region, there are numerous species, some of which only grow on one particular mountain", explains the researcher. These so-called endemic species are of particular botanical interest. Yet anyone hoping to find them must venture beyond the well-trodden paths. The moisture-loving philodendrons grow most readily on the cloudy, windy slopes of the mountains, which reach up to 1,800 metres.

When the small aircraft lands on a remote runway in the forest, only the first stage of the journey has been completed. The scientists must still travel by boat along the rainforest

ivers, and then venture further, on horseback, into the tropical forests. The peaks they are trying to reach, however, are inaccessible to even the most robust means of transport. The only way there is on foot. "Carrying 18 kg of luggage on your back, it can be quite a difficult trek", says Nils Köster. Nevertheless, these trips were a special experience for him: "We were in regions where, most likely, nobody has ever before collected plants for science."

Not all the trip was quite so adventurous. "What we did", sums up the Berlin scientist, "was a really exciting mix of jungle expedition and roadside botany". Especially in Costa Rica, *Philodendron* researchers can find specimens right beside transport routes. Even there, it's true, these plants, whose name means "tree friend", often grow high up among the branches of the rainforest giants. This makes them difficult to reach. Occasionally, even using the 10-metre telescopic shears brought from home, the botanists had to admit defeat.



Travelling in Darién, Panama.

Nevertheless, by the end of the day, the bed of their pickup truck was often piled high with greenery. It had to be dealt with straight after their evening meal – tricky work, in the case of philodendrons. The leaves, some of which are almost two metres long, need to be cut, folded and pressed so that they fit onto a herbarium sheet. This must be done without losing their structure: ultimately, the original shape needs to be identifiable later on. This skilful task often kept the researchers busy deep into the night.

They are convinced, however, that all these exertions were worthwhile. "On this trip, we found well over a hundred *Philodendron* species", Nils Köster explains with satisfaction, "and some of them are brand new to science". Hundreds of pressed plants were added to the herbaria of the local cooperation part-

ners, with duplicates sent to Berlin. The DNA samples from Central America have already provided new knowledge about how these plants developed in the area between North and South America. And some of the many cuttings will, it is hoped, grow into impressive "tree friends", to be marvelled at by visitors to the Botanic Garden greenhouses.

Taxonomy teamwork

European networks are driving progress in biodiversity research

For a long time, taxonomy had to contend with a rather fusty image: classifying the various living things into species, genera, families and other biological categories was something that only a relatively small circle of scientists seemed to find exciting. "Now, however, there's more and more interest in the results of this research", explains Dr Eva Häffner, who works at the Botanic Garden Berlin as science policy coordinator. "We need taxonomic research so that we can better understand and protect the Earth's ecosystems."

This makes it even more important, in her view, to give a political and public voice to this branch of science. This, indeed, is one of the goals of the CETAF network (Consortium of European Taxonomic Facilities), formed of 73 biological and geological partners from all over Europe. The institutions involved are eager to work together to research and document biodiversity, to make their collections more accessible and to push ahead with international research projects.

"We've already achieved a lot thanks to this European cooperation", reports Eva Häffner, who is on the board of CETAF. The European Commission frequently calls upon the expertise of the network, to help with legislation on nature conservation or for a thorough overview of experts in Europe working on pollinating insects, for example. "The EU now realises that the economy cannot function without biodiversity", says the expert. "And it is incredibly valuable for us to be able to express our views at European level."

The consortium has already made considerable not only political, but also technical progress. It has launched an ambitious and revolutionary project known as DiSSCo (Distributed System of Scientific Collections). This initiative aims to combine, digitally, 1.5 billion pieces from the collections of more than 170 natural science institutions into one virtual European collection. "This is the biggest ever initiative of this type at European level", says Eva Häffner. "It enhances the value of our collections as



<https://cetaf.org>



Distributed System of Scientific Collections



<https://www.dissco.eu>

research infrastructure”, adds Thomas Borsch, Director of the Botanic Garden Berlin, one of the six German institutions involved in DiSSCo. Importantly, many European governments are already supporting DiSSCo, because since 2018 it has been classified in European research policy as an important infrastructure project. Data and knowledge on biodiversity are urgently needed to achieve sustainable development in Europe.

An important milestone in December 2022 was the securing of support by CETAF for a large-scale joint project: TETTRIs (Transforming European Taxonomy through Training, Research and Innovations). This project, involving 17 partner institutions from 11 EU countries, is receiving 6 million euros in funding from the European Commission. “It aims to make expertise on the biodiversity of organisms more widely available”, explains Eva Häffner, “particularly in biodiversity hot spots”.

Some of the project budget is allocated to very practice-oriented measures. One approach is to promote the training in taxonomy of PhD students, nature conservationists and other stakeholders. The project should also enable new field techniques for identifying species, such as automatic image and sound recognition, to be tested in situ and further developed. Another aspect of TETTRIs is to promote the development of reference collections for species groups, such as pollinators. The project involves a lot of work for computer scientists: “We are coordinating a work package developing a central checklist of all European species”, reports Anton Güntsch, director of the Center for Biodiversity Informatics and Collection Data Integration at the Botanic Garden Berlin.

Although the TETTRIs project terminates at the end of May 2026, the system providing sustainable and needs-based support to taxonomic research will remain.



<https://tettris.eu/the-project>

From pheasant's eye to cistus

With support from the Botanic Garden Berlin, a complete flora of Greece is being developed

All around there's new life, green shoots, blossom, fragrance. Greece has a very varied vegetation: almost 7,000 species and subspecies. "But it's also one of the few countries in Europe for which there is still no complete flora", says Dr Konstantina Koutroumpa, a biologist from the Botanic Garden Berlin. Since 2020, she has been working on a project to fill this gap. The project is coordinated by the universities of Patras, Athens and Thessaloniki, together with the Botanic Garden Berlin, and involves many scientists from other institutions in Greece and other European countries. The result will be a work in ten volumes, also available online, giving a complete presentation of all the plant species growing in Greece.

The manuscripts for the first plant groups are currently being prepared for the online preprint. Yet the project will not just generate descriptions, identification keys and illustrations. It also aims to investigate species boundaries, to improve understanding of the species that grow in Greece. Some regions of the country, such as the Aegean Islands or the mountains of the Peloponnese, have produced many species that grow nowhere else in the world, yet

in many cases very little is known about these so-called endemic species.

A flora for Greece is urgently needed for, among other things, biodiversity monitoring, as it will act as the knowledge base for assessing plant diversity and will enable accurate identification of species. "But what is essential", explains Konstantina Koutroumpa, "is to move ahead with research into the species-rich plant genera in Greece, to provide the data needed for the flora". One aspect of the project is therefore to provide funding for young Greek and German scientists to do this work, because scientific research into the flora of Greece is a mammoth task. "And at the moment, there are no experts on many of these genera", continues Konstantina Koutroumpa.

In this context, the researcher herself has therefore taken on a particularly challenging and exciting task. She is working on knapweeds (*Centaurea*), a genus with around 150 species and subspecies, the largest plant genus in Greece. It also includes numerous endemic species.



Centaurea finazeri subsp. *kozanii*, from the Grevena region.



Centaurea vandasii, on Mount Belles.



The Venetikos river flows through the eastern foothills of Mount Orliakas, through the Portitsa gorge.



Konstantina Koutroumpa and Nick Turland place the collected plants into the press, to make herbarium specimens.

“My goal is to establish a clear record of all the *Centaurea* species in Greece, to clarify the relationships between them and then to prepare specific descriptions, to be published in the flora”, says the botanist.

Between May and August 2022 the scientist spent a total of two months in the field, between the coast and the high mountains, collecting the species that the record was missing. After travelling around 12,000 kilometres

through 120 mainland regions and numerous islands, the results were impressive: Konstantina Koutroumpa returned to Berlin with 560 herbarium specimens, the same number of DNA samples and thousands of photos of knapweeds. She now has a collection of virtually all representatives of the genus. And what is more, using the material collected and working with other colleagues, she has even been able to describe a new species: *Centaurea dolopica*.



[Flora of Greece-Checklist](#)



[Article on the newly described species *Centaurea dolopica*](#)

Sleeping Beauty awakes

Extensive building work is currently underway in the outdoor areas of the Botanic Garden. It will make this 120-year-old historic garden even more user-friendly.

Nobody who visited the Botanic Garden in 2022 can have failed to see the extensive building work going on. Visitors sometimes found this irritating, quite justifiably. However, it will be worth being patient and giving the garden time to regenerate. Step by step, a plan is being implemented to enhance the visitor experience and make future visits even more restorative and informative. It aims to awaken the garden from its tourism status as a Sleeping Beauty and to attract even more visitors from Berlin and from across the world.

“To achieve this, more than 20 million euros are being invested in tourism infrastructure”, explains garden manager Thorsten Laute. Just like the renovation of the Botanical Museum, this work is being funded by the federal authorities and the Berlin state government, from the “Joint Scheme for the Improvement of Regional Economic Structures” (GRW), with a co-payment from the Freie Universität Berlin.

This money is funding a very complex project, involving a whole range of measures – from the building of a visitor centre to renovation

of the toilets. Most of the around 23 kilometres of connected paths will be restored, to enable visitors, including those with mobility issues, to move safely and easily around the garden in all weathers. Gardening and technical concerns have therefore had to be combined with the demands of historic garden preservation: a major challenge! A modern signage and information system will make it easier for visitors to find their way around. The garden displays, too, will include some new features.

At the Unter den Eichen (Under the Oaks) entrance there will be an ornamental garden with an impressive show of colour. Diagonally across the flowerbeds, visitors will see a sort of plant rainbow: sunny yellow, orange, red, through to deep purple. Another new feature is the useful plants garden. Here visitors will be able to learn which plants are suitable for eating, producing dyes or generating energy. Children and young people, as well as families, can also get involved in the gardening work, from sowing to harvesting, and find out which garden structures and cycles encourage biodiversity.



Restored path in the Botanic Garden arboretum.



Following restoration, the lily pond could be replanted.



The restored Italian Garden dazzles in all its glory.

Imagination is still needed to see past the barriers and machines and picture the future garden. But some of the work has already been completed. "In 2022, we finished the renovation of the listed Italian Garden, with the water lily pond", says Thorsten Laute with satisfaction. This terraced garden below the greenhouses was laid out by the garden pioneers as early as 1900. At the time, it was inspired by the geometrical gardens of early Italian Renaissance villas. "From above, this garden looks like a Jugendstil dragonfly, with a lily pond as its head", says Thorsten Laute. However, it had not been its glorious self for a long time. It is still bordered by yew trees dating back around 150 years, which used to grow in the old Botanic Garden in Schöneberg. Over the years, these rows of conifers had gradually thinned out, and other features of the Italian Garden had also been ravaged by time.

Now new yews have been planted, the twelve baroque cast-iron vases have been restored and the white coating of the benches has been replaced. Not only that! The lily ponds have also been re-waterproofed with mats made of carbon fibre-reinforced concrete. And in 2022 a new pressure water pipe was brought into service, to supply the Italian Garden with water, automatically and economically. This is another step towards the garden of the future. Sleeping Beauty is gradually awakening from her deep sleep.

Dialogue between two continents

Museum experts from Africa and Europe discuss colonial contexts in botany

"The history of botany is linked with colonialism in many ways", says Nadine Csonka from the Botanic Garden Berlin. These links do not show this branch of science in a flattering light. For that very reason, it is important to discuss the issue, including in the Botanic Garden Berlin which, from 1891 until 1920 and from 1939 to 1943, housed the "Botanische Zentralstelle für die deutschen Kolonien" (Central Botanical Agency for the German Colonies).

This institution gathered knowledge from the colonies about crops and the potential for cultivating them. It researched cocoa pests and diseases affecting coffee bushes, encouraged the cultivation of vanilla from Central America in German East Africa (in what is now Tanzania, Rwanda and Burundi) and transported oil palms from Cameroon to German Samoa (today the Independent State of Samoa).

These actions were motivated by tangible economic interests – but not by these alone. This was the beginning of a period of fundamental research into the flora and vegetation of these regions. Vast numbers of living and dried plants were sent to Berlin for scientific examination, and there was a boom in the description of new species. The historian Dr Katja Kaiser has focused on the example of the Central Botanical Agency to investigate relations at that time between the sciences and colonialism. For her dissertation for the Department of History and Cultural Studies of the Freie Universität Berlin, she worked closely with the Botanic Garden.

Other botanic gardens in Germany are also carrying out a self-critical analysis of their role and responsibility during the German colonial era. In 2022, the Verband Botanischer Gärten e.V. (Association of Botanical Gardens) published a position paper on this topic. "When doing this work, it's very important for us to include formerly colonised societies in the process", emphasises Nadine Csonka.

A good opportunity for a joint dialogue between the African and European continents was provided by MuseumsLab, an international networking programme funded by the German Federal Foreign Office. It brings together museum experts and scientists from Africa and Europe, to develop plans for future museum work. More than 50 of the programme's fellows had travelled to Berlin in June 2022, to work together and to find out more about the past and present activities of various institutions. One of the locations they visited was the Botanic Garden Berlin.

After guided tours of the gardens, the greenhouses and the herbarium, the MuseumsLab participants and Botanic Garden representatives exchanged ideas in three workshops. One of these discussed the opportunities provided by the digitisation of scientific collections for current cooperation between the Global North and the Global South. A second workshop considered the life-stories of the objects in these collections. The third workshop, with



The MuseumsLab



Dr Katja Kaiser's dissertation



MuseumsLab participants on a guided visit of the Main Tropical Greenhouse.

by far the most participants, discussed the creation of the new permanent exhibition in the Botanical Museum, under the heading: "From suitable (re)presentation to postcolonial memory".

In these contexts, the colonial and institutional history of the Botanic Garden and the treatment of particular objects in the collection were discussed in a lively but respectful debate. Unlike for many ethnological museums, the origin of the objects in the collection was not so heavily criticised. Rather, the main issue was the reproduction of colonial-style images. The MuseumsLab participants were particularly unhappy with a diorama first produced in the 1960s for the exhibition in the then Botanical Museum. It shows a seemingly idyllic scene on a cocoa plantation in Cameroon. "Many of our African guests found the idealised presentation of the plantation economy inappropriate or even insulting",

recalls Nadine Csonka. The stylised scene on the cocoa plantation is nothing like the tough reality of the plantation economy, which is still exploiting both people and nature.

"Our discussions with the fellows, with their differing skills and perspectives, were very valuable for us and gave us real momentum for our work on the permanent exhibition", confirms Susanne Feldmann, who is jointly responsible for this as head of the Museum and Exhibitions unit at the Botanical Museum.

The discussions with the MuseumsLab fellows also encouraged a group of colleagues – scientists, herbarium and administrative staff – to meet regularly to consider the colonial contexts of the institution, its collections and its research. In the new permanent exhibition in the Botanical Museum, but also in the Main Tropical Greenhouse and the greenhouse containing tropical crops, information is to be



Nils Köster, curator of the tropical and subtropical living collection, with MuseumsLab participants in the Victoria House.

given on the issue of botany and colonialism. "We don't want to brush the colonial past under the carpet", stresses Nadine Csonka. "It's part of our history, so we are keen to illuminate it from a critical angle, and explain this link to our visitors." A thorough historical analysis will require more time and resources and is still only one part of the process.

The continuities from the colonial past, which still mark the relationship between Global North and Global South, were clearly visible in all three workshops with the MuseumsLab participants. So, what can be done about this? The fellows from the African and European museums agreed with their colleagues from the Botanic Garden Berlin on some important

approaches: what is first needed is a critical appraisal of the colonial period, together with an appropriate way of remembering this time. Second, the perspective needs to change, to combine the viewpoints of the two continents. The traditional Eurocentric outlook is no longer valid in today's world. Culture and science, with the appropriate support, can make a key contribution to the dismantling of these asymmetries.



**German Association of Botanic Gardens – position paper:
Botanic gardens, plant collections and colonialism**

Learning in the treasure chamber

Madalena Lourenço from Portugal has completed a one-year internship in the Botanic Garden herbarium

"What better place of work than a botanic garden?" Madalena Lourenço, a biologist born and bred in Lisbon, cannot think of one. So she applied for an internship in the herbarium of the Botanic Garden Berlin. "After my bachelor's degree, I wanted to first do some practical work", she explains. And she knew exactly which area of biology attracted her most. "I noticed early on that I have a particular interest in plants and ecology." Even better, this inclination was coupled with a wish to learn better German: a placement in Berlin was the ideal opportunity to combine the two.

Madalena Lourenço first spent half a year, from September 2022 to February 2023, as an

Erasmus student at the Botanic Garden. Then, for the following six months on a working student placement, she was able to delve deeper into what she had learned. "We don't have a special internship programme", explains her supervisor Dr Robert Lücking, the cryptogam curator, whose area of responsibility includes fungi, lichens and mosses. Anyone who wants to get a taste of the work done in the herbarium must therefore make an unsolicited application and provide their own funding. In return, these next-generation scientists gain a good insight into the varied work of the curators who, together with a team of staff, care for these collections.



Madalena Lourenço working on the digitisation of lichen specimens in the herbarium.



ISO TYPUS

Mus. Bot. Berol.



B 60 0168917

FLORA COLOMBIANA

Hypotrachyna convexa R.P. Baayen & H. Rügenbrink

ISOTYPE

Hab: CUNDINAMARCA: Páramo de Palacio,
Lagunas de Buitrago y
alrededores, vertiente
SW del cerro al N de las Lagunas.
Líquenes epilíticos.

Leg: Antoine M. Cleef Alt: 3650 m.

dd: 9-XII-1.971 No. 116 o.

Det: R.P. Baayen, IV-1982



revisie van de Colombiaanse *Hypotrachyna*'s

HYPOTRACHYNA convexa R.P. Baayen & H. Rügenbrink

conf: R.P. Baayen, Utrecht mrt 1982
det: R.P. Baayen, Utrecht mrt 1982

Revision of Neotropical *Hypotrachyna*
by J.A. Elix, T.H. Nash & H. Sipman, 1998-99
coll. Cleef 116c det. H. Sipman, Berlin
TLC, sample nr. H2802, pl. H254, solvent A, B
usnic, protocetraric acids, indet. trace.

Revision of Neotropical *Hypotrachyna*
by J.A. Elix, T.H. Nash & H. Sipman, 1998-2004
coll. 116c det./conf. H. Sipman, Berlin

Hypotrachyna convexa R.P. Baayen & H.
Rügenbrink ex Sipman, Elix & T.H. Nash

MUSEUM BOTANICUM BEROLINENSE

Hypotrachyna convexa

The isotype of *Hypotrachyna convexa*, a lichen species described from Colombia, and one of the many type specimens in the lichen collection of the Berlin herbarium digitised by Madalena.



Madalena Lourenço works on the database entries for the digitised herbarium specimens.

"The most important thing", says Robert Lücking, "is to learn the techniques used in a herbarium". These herbarium techniques and the skills required can be learnt as part of the collection management module, or during an internship. "It's obviously also helpful if later you wish to apply for this sort of post", says the expert.

How are the dried plant specimens mounted on herbarium sheets? What should be on the label? During the digitisation process, what needs to be borne in mind when photographing the individual sheets and entering the information into databases? And how can scientists from other institutions borrow specimens? Madalena Lourenço learnt all this during her placement in various areas of the

collection. She worked with lichens, fungi and mosses, but also with flowering plants, and is now very used to dealing with the large quantities of herbarium specimens and data in the Berlin botanical treasure chamber. "I have learnt to be more organised and to work more independently", sums up the student curator. "But above all, it was a real privilege to be able to work with such great people. That was the most exciting aspect for me."

After her time in Berlin, she hopes to combine her enthusiasm for nature with her keen interest in towns and cities, and to begin a master's course in Lisbon, on sustainable town planning. "I hope that in the future I can use everything I learnt in the Botanic Garden."

The family tree of scorzoneras and co.

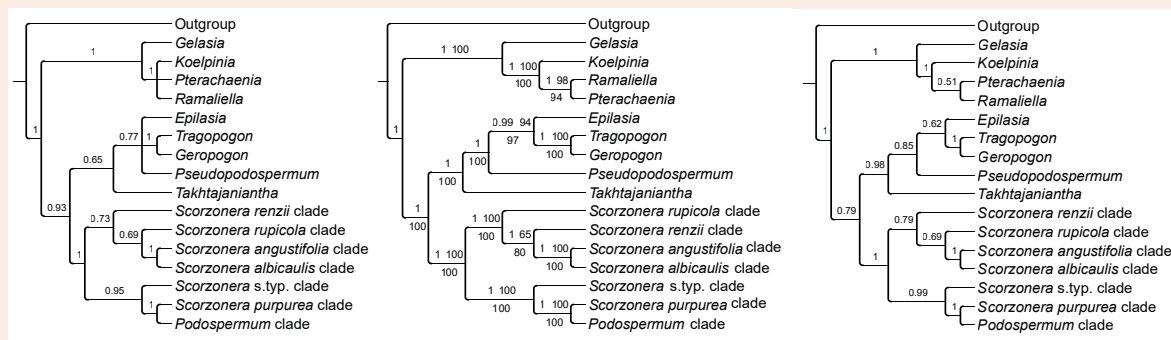
Genomic insights into the complicated interrelationships within a group of daisies

The *Scorzonera* genus, which includes the vegetable black salsify, has been puzzling scientists for 200 years. "150 species or so were either included in a genus, because of the many similarities between them, or were classified in different genera, because of clear differences, such as in the shape of their fruit", explains Dr Norbert Kilian, head of the *Asterales* research group at the Botanic Garden Berlin. For several years, he and his team have been studying *Scorzonera* species and their relations, the so-called *Scorzonerinae*. Using modern genomic methods, they have put an end to the guesswork surrounding these genera, whose family tree was, until now, unknown.

The *Scorzonerinae* include over 300 species of mostly yellow- or purple-flowering daisies (*Asteraceae*), which grow especially in southern Europe, North Africa and the non-tropical regions of Asia. Scorzoneras are native to Central Europe, as are goatsbeards, which

include plants such as meadow salsify. The evolutionary history and the relationships between these plants are difficult to clarify, not only because of their outward similarities. Molecular methods had also reached their limits. "The differences between even major lineages are often so small that the lineage cannot be traced using traditional genetic markers", explains Norbert Kilian.

The solution to this problem came only with the advent of high-throughput sequencing, which enables the parallel sequencing of vast quantities of DNA, in a very short time. Instead of a few individual markers, larger parts of the genetic material can now be compared. In this way, it is possible to focus on selected areas particularly suited to family tree reconstruction. And the system works, too, with plants that have deteriorated with age: even nineteenth-century herbarium specimens could be investigated with no difficulty.



Reconstruction of the *Scorzonerinae* family tree using high-throughput sequencing. The three family trees shown here, reduced to the major lineages, were calculated using different procedures, but largely coincide. Here we show the lineages corresponding to the *Scorzonerinae* genera, as well as the seven lineages within the *Scorzonera* genus.

Dr Elham Hatami from Kerman University, Iran, during her one-year research stay in Berlin, produced more than 1,000 DNA markers for each of the 152 plants sampled, working with Norbert Kilian and Dr Katy Jones in the molecular laboratory of the Botanic Garden Berlin. Using the extensive analyses of this huge data set carried out on the high-performance computer of the Freie Universität, the team reconstructed the first watertight family tree for *Scorzonerinae*, and published it in July 2022 in the scientific journal *Frontiers in Plant Science*.

The study has also produced another interesting result. "The genetic material shows us that, in the course of evolution, there was cross-breeding in this plant group, not just between species, but also between different genera. The differences in appearance and genetic material were therefore blurred", says Norbert Kilian. This explains why it is so difficult to differentiate between the various lineages of scorzoneras and co.



Scorzonera angustifolia on coastal cliffs at Agua Amarga in Andalusia, Spain.



New insights into the relationships within subtribe *Scorzonerinae* (*Cichorieae*, *Asteraceae*) using hybrid capture phylogenomics (Hyb-Seq)

Attentive hosts

The work done by the visitor service team is important and varied

What is particularly worth seeing in the Garden? How much does a yearly entry cost? The path over there is closed for building work – how do I get through? And what sort of bush is that, with those wonderful flowers? A relentless stream of questions are put to the visitor service team every day, especially since the Garden reopened fully after the pandemic crisis. In 2022, the Botanic Garden welcomed far more plant-lovers, people seeking relaxation or information, or curious visitors. "So, we could finally do what we're here for", says Annika Holzki, who coordinates the service team, "which is to make every visit a great experience".

This task involves all sorts of very varied aspects. At the counters, the team members sell day tickets, yearly tickets and tickets for special events. At the gate, they have not only to point suppliers in the right direction or to give keys to the gardeners. They also receive phone calls from people with questions concerning a planned visit. And finally, the service team in the garden go out on patrol, speaking with guests and keeping an eye on things.

"So it's an extremely varied job", says Annika Holzki, particularly since her 15 colleagues have mastered all of these aspects and are therefore constantly switching between the various tasks. "They're all fun, because every day is different", explains the coordinator, from her own experience. In the past, security training was needed for this job, but now, people from all sorts of professional backgrounds can apply. "The main thing is to be friendly, open and communicative", says the expert. "In that case, you're in the right place."

After all, discussions with visitors are at the heart of the job. And sensitivity is needed to strike the right tone. The staff may have to ask people to overlook disruptive building work, remind visitors that the trees are not suitable climbing frames for children, or that the right place to sunbathe or picnic is the specially designated lawn, and not an area containing sensitive plants. "If you explain everything to the guests calmly, most agree and play ball", says Annika Holzki. There's very rarely any real trouble.



Annika Holzki at the visitor centre till, at the main Königin-Luise-Platz entrance.

Sometimes, however, the police have to intervene: plant theft is no joke and is not that unusual. An amateur gardener may easily think it's a good idea to take a couple of cuttings back home. Or criminals come with the specific aim of carrying off valuable material, which can be sold at a high price. "Whatever the motive, we report all thefts to the police", emphasises Annika Holzki.

Most of the people coming into contact with her team in its day-to-day work are just looking to relax, experience nature and find out

more about it. And the service team is happy to help with this. "I'm always pleased when someone really enjoyed the garden", says the coordinator. "Maybe a satisfied guest will encourage a couple of friends to come along." She's also even seen that a love of plants can be passed down through the generations: people who bought tickets from her when they were young are now coming along with their own children. For the visitor service team, this demonstrates the success of their work.

The newly discovered diversity of Colombian fungi

7,000 species are probably just the tip of the iceberg

Colombia is one of the world's biodiversity hot spots. Its location on the border between South and Central America, and the wide range of habitats – from coastal areas to some of the highest peaks in the Andes – have given the country a vast number of species. The huge variety of fungi alone is illustrated in the book *Catalogue of Fungi of Colombia*, published in 2022 and the result of a collaboration between Dr Robert Lücking of the Botanic Garden, Dr Bibiana Moncada of the Universidad Distrital in Bogotá, and other associated scientists in Berlin.

is on tropical lichens. Colombia is an exciting location for this research, not just because of its huge range of species.

In 2016, after decades of armed conflict, a peace settlement negotiated between the government and the leftist guerrilla movement FARC also opened up new possibilities for science. "Now we can explore areas that were inaccessible for years", explains Bibiana Moncada. In these regions, there is a strong likelihood of discovering new species and ecological connections.

The Botanic Garden Berlin has a long tradition of researching these organisms. Until it was destroyed in the Second World War, the fungi herbarium was the largest in Europe. Now the collection, with its around 650,000 specimens of lichens and fungi, is again of international significance. One of the main focuses of the research done by Robert Lücking and his team

"In particularly species-rich countries, fungi can often be overlooked", says Robert Lücking. But in Colombia this is no longer the case. The country's mycologists – fungi researchers – are very active. A few years ago, they formed an association, the "Asociación Colombiana de Micología", which is doing some very successful research and dissemination work. "So



The bright pink fruiting bodies of *Phyllobaeis imbricata* are eye-catching.



Scleroderma flavidum is a fungus of the earthball genus.



Campanella caesia, the marram oysterling, can be found throughout the world.

in Colombia, there is much more public and political awareness of the issue of fungi than in many other countries”, explains Robert Lücking.

It is often emphasised that the diversity also has very practical benefits for humans. A project recently completed under the leadership of the Royal Botanic Gardens, Kew, was entitled “Useful plants and fungi of Colombia”. For this, researchers from Colombia, the

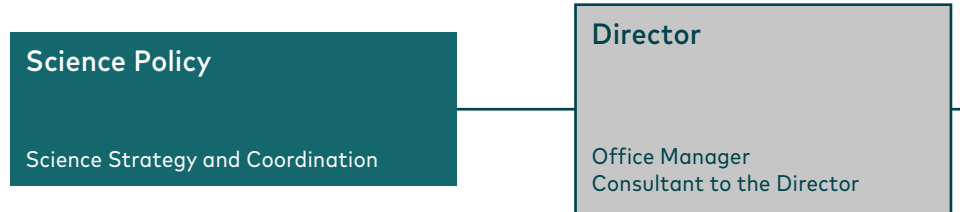
United Kingdom and Germany investigated how the country’s biodiversity can be used in a sustainable way. The catalogue of fungi was developed as part of this process: it is a huge, richly illustrated book, listing more than 7,000 species and setting Colombia’s variety of fungi in a broad context. “It’s probably just the tip of the iceberg”, says Robert Lücking. In his view, it is entirely possible that this country between South and Central America could house more than 40,000 species of fungi.



Rafael F. de Almeida, Robert Lücking, Aída Vasco-Palacios, Ester Gaya, Maruicio Diazgranados (ed.): *Catalogue of Fungi of Colombia*

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Facts & figures

STAFF

EMPLOYEES TOTAL



90
SUPPORT STAFF

34
SCIENTISTS AND CURATORS

88
EMPLOYEES IN THE GARDEN



86
SUPPORT STAFF

37
SCIENTISTS AND CURATORS

94
EMPLOYEES IN THE GARDEN



TRAINEES

11

2021

12

2022

VOLUNTARY ECOLOGICAL YEAR

1

2021

1

2022

VISITING SCIENTISTS

incl. visiting scientists
in the herbarium

NATIONAL

19

2021

52

2022

INTERNATIONAL

24

2021

27

2022

DOCTORAL STUDENTS

2022



2 NATIONAL
6 INTERNATIONAL

5 FEMALE
3 MALE

AFFILIATED AND HONORARY SCIENTISTS

56

2022

Dr Neela Enke
Prof. Dr Werner Greuter
Dr Elham Hatami
Peter Hirsch
Dr Regine Jahn
Dr Katy Jones
Prof. Dr Hans-Walter Lack
Dr Bibiana Moncada
Dr Daniel Montesinos Tubée

Dr Demetrio Mora
Dr Rosa Rankin
Dr Thomas Raus
Michael Ristow
Dr Henricus Sipman
Prof. Dr. Arne Strid
Prof. Dr. Eckhard Willing
Dr Brigitte Zimmer (Prof. a.D.)

VOLUNTEERS

2022



Evelin Bartels; Barbara Bartz; Lotte Burkhardt; Sonja-Maria Czérkus-Yavuz; Dr Christian Feldt; Margit Keipke; Erich Liebert; Tjalda Picksak-Schmidt; Gudrun Scharte; Cora-Beate Schaumann; Birgit Schubert; Regina Stark; Dietmar Weinert; Gabriele Winde.

Due to data protection regulations, we are only permitted to name volunteers who have explicitly given their consent. The BGBM is supported by numerous volunteers who are not named here but to whom we owe enormous thanks for their ongoing commitment.



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CONTRIBUTIONS TO TAXONOMIC INFORMATION SYSTEMS

- Raab-Straube E. von** 2022+ (continuously updated): *Cornaceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/9960673b-0736-476d-a13c-7ca550d515c8
- Raab-Straube E. von** 2022+ (continuously updated): *Ephedraceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/2e1e462b-7b34-4084-8ed5-eed7e7784a03
- Raab-Straube E. von** 2022+ (continuously updated): *Garryaceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/d21afa51-d02f-428f-925d-ac8237cc5461
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- Raab-Straube E. von** 2022+ (continuously updated): *Myrtaceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/9bc8578c-744d-44d5-9bdc-4bee1e4e7f12
- Raab-Straube E. von** 2022+ (continuously updated): *Oleaceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/4e1081c2-8f08-4fbd-a4c2-6efa1a0d9c77
- Raab-Straube E. von** 2022+ (continuously updated): *Verbenaceae*. – In: Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. – Published at https://europlusmed.org/cdm_dataportal/taxon/bc8ce50f-c27f-4d09-a87c-5620ef95892b

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SPECIES NEWLY DESCRIBED BY BGBM AUTHORS

2022



LICHENS

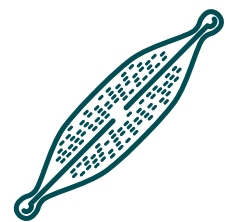
NAME	COUNTRY OF ORIGIN
<i>Carbacanthographis acanthoamicta</i> Feuerstein & Lücking ¹⁾	Papua New Guinea
<i>Carbacanthographis acanthoparaphysata</i> Feuerstein & Lücking ¹⁾	Papua New Guinea
<i>Carbacanthographis aggregata</i> Feuerstein & Lücking ¹⁾	Malaysia
<i>Carbacanthographis amazonica</i> Feuerstein & Lücking ¹⁾	French Guiana
<i>Carbacanthographis aptrootii</i> Feuerstein & Lücking ¹⁾	China
<i>Carbacanthographis brasiliensis</i> Feuerstein & Lücking ¹⁾	Brazil
<i>Carbacanthographis chionophoroides</i> Feuerstein & Lücking ¹⁾	Colombia
<i>Carbacanthographis halei</i> Feuerstein & Lücking ¹⁾	Malaysia
<i>Carbacanthographis latispora</i> Feuerstein & Lücking ¹⁾	Venezuela
<i>Carbacanthographis multiseptata</i> Feuerstein & Lücking ¹⁾	Venezuela
<i>Carbacanthographis novoguineensis</i> Feuerstein & Lücking ¹⁾	Papua New Guinea
<i>Carbacanthographis pseudorustica</i> Feuerstein & Lücking ¹⁾	Malaysia
<i>Carbacanthographis salazinicoides</i> Feuerstein & Lücking ¹⁾	Papua New Guinea
<i>Carbacanthographis sipmaniana</i> Feuerstein & Lücking ¹⁾	Malaysia
<i>Carbacanthographis spongiosa</i> Feuerstein & Lücking ¹⁾	Brazil
<i>Carbacanthographis subchionophora</i> Feuerstein & Lücking ¹⁾	Papua New Guinea
<i>Pertusaria lucidotetra</i> Sipman ²⁾	Colombia/neotropics
<i>Pertusaria pseudoparnassia</i> Sipman ²⁾	Ecuador
<i>Pyrenula aurantiacoretis</i> R. Miranda, Bungartz, Lücking & Herrera-Camp. ³⁾	Mexico
<i>Pyrenula connexa</i> R. Miranda, Lücking, Gaya & Herrera-Camp. ³⁾	Mexico
<i>Pyrenula moldenkeorum</i> R. Miranda, Bungartz, Lücking & Herrera-Camp. ³⁾	Mexico
<i>Racoplaca macrospora</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Racoplaca maculatoides</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Sticta amboroensis</i> Ossowska, Kukwa, B. Moncada & Lücking ⁵⁾	Bolivia
<i>Sticta aymara</i> Ossowska, Kukwa, B. Moncada, Flakus, Rodriguez-Flakus & Lücking ⁵⁾	Bolivia
<i>Sticta bicellulata</i> Ossowska, Kukwa, B. Moncada & Lücking ⁵⁾	Bolivia
<i>Sticta carrascoensis</i> Ossowska, Kukwa, B. Moncada & Lücking ⁵⁾	Bolivia
<i>Sticta narinioana</i> B. Moncada, Ossowska & Lücking ⁵⁾	Bolivia



LICHENS

NAME	COUNTRY OF ORIGIN
<i>Sticta pseudoimpressula</i> Ossowska, Kukwa, B. Moncada & Lücking ⁵⁾	Colombia
<i>Strigula guangdongensis</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula intermedia</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula laevis</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula microcarpa</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula pseudoantillarum</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula pseudosubtilissima</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula pycnoradians</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	Thailand
<i>Strigula sinoconcreta</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula stenoloba</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China
<i>Strigula subtilissimoides</i> S. H. Jiang, J. C. Wei & Lücking ⁴⁾	China

DIATOMS



NAME	COUNTRY OF ORIGIN
<i>Cocconeis czarneckii</i> Stancheva, L. D. Mora & R. Jahn ¹³⁾	U.S.A.

VASCULAR PLANTS



NAME	COUNTRY OF ORIGIN
<i>Anthurium bajobonitense</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium belenense</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium berguidoi</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium carrionii</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium floresii</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium glandulicostum</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium guadalupeae</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium insolitum</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium mercadoi</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium morrisii</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium muscidiradix</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium tscuiense</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium veraguense</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium zachdufranianum</i> O. Ortiz & Croat ⁶⁾	Panama
<i>Anthurium jaimefolsomii</i> O. Ortiz & Croat ⁷⁾	Panama
<i>Anthurium xanthum</i> Croat, O. Ortiz & Hormell ⁷⁾	Panama
<i>Anthurium mittermeieri</i> Diaz Jim., M. Cedeño & Pérez-Farr. ⁸⁾	Mexico
<i>Miconia amplipedunculata</i> Almeda & O. Ortiz ⁹⁾	Panama
<i>Monstera tablasensis</i> M. Cedeño ¹⁰⁾	Costa Rica
<i>Philodendron chepiganense</i> O. Ortiz, Croat & Rodr.-Reyes ¹¹⁾	Panama
<i>Philodendron coibense</i> Croat & O. Ortiz ¹¹⁾	Panama
<i>Philodendron darienense</i> O. Ortiz, Croat & Rodr.-Reyes ¹¹⁾	Panama
<i>Philodendron martinezii</i> Croat & O. Ortiz ¹¹⁾	Panama
<i>Philodendron monroi</i> Croat & O. Ortiz ¹¹⁾	Panama
<i>Philodendron samudioense</i> Croat & O. Ortiz ¹¹⁾	Panama
<i>Stenospermation coques</i> Al. Rodr., O. Ortiz & M. Cedeño ¹²⁾	Cocos Island, Costa Rica

NEWLY DESCRIBED FAMILIES AND GENERA

2022

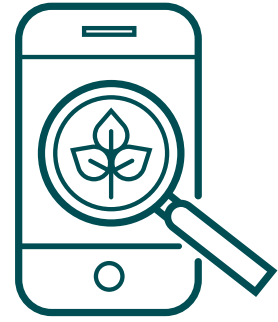
NAME	ORGANISM	REGION OF ORIGIN	FAMILY / GENUS
<i>Caucososeris</i> M. Güzel, N. Kilian, Sennikov & Coşkunç. ¹⁴⁾	vascular plant	Caucasus	new genus
<i>Krenakanthus</i> (Leme, S. Heller & Zizka) Leme, Zizka & Paule ¹⁵⁾	vascular plant	Brazil	new genus
<i>Orthocryptanthus</i> (Leme, S. Heller & Zizka) Leme, Zizka & Paule ¹⁵⁾	vascular plant	Brazil	new genus
<i>Siqueiranthus</i> Leme, Zizka, E. H. Souza & Paule ¹⁵⁾	vascular plant	Brazil	new genus

SOURCES

THE FULL BIBLIOGRAPHIC REFERENCES CAN BE FOUND IN THE LIST OF PUBLICATIONS ON PP. 57–63:

- 1) Feuerstein & al. 2022 – Lichenologist 54: 45–70.
- 2) van den Boom & al. 2022 – Acta Botanica Hungarica 64: 417–450.
- 3) Miranda-González & al. 2022 – Bryologist 125: 541–557.
- 4) Jiang & al. 2022 („2021")* – Journal of Fungi 8(1, 2): 1–30.
*Not put online until 2022, although indicated as published on 21 December 2021.
New species were not included in the 2021 report.
- 5) Ossowska & al. 2022 – MycoKeys 92: 131–160.
- 6) Croat & al. 2022 – Aroideana 45: 48–436.
- 7) Croat & al. 2022 – Aroideana 45: 84–99.
- 8) Díaz Jiménez & al. 2022 – Aroideana 45: 249–258.
- 9) Almeda & Ortiz 2022 – Phytotaxa 575: 294–300.
- 10) Cedeño-Fonseca & al. 2022 – Aroideana 45: 162–164.
- 11) Ortiz & al. 2022 – Novon 30: 18–42.
- 12) Rodríguez-González & al. 2022 – Anales del Jardín Botánico de Madrid 79(e128).
- 13) Mora & al. 2022 – Phycologia 61: 60–74.
- 14) Güzel & al. 2022 – Willdenowia 52: 103–115.
- 15) Leme & al. 2022 – Phytotaxa 544: 128–170.

ONLINE RESOURCES AND DATABASES



1. DIGITISED COLLECTIONS AT THE BGBM

Virtual Herbarium – Digital Specimen Images at the Herbarium Berolinense – access to the Berlin data in the JACQ System (see below)

<https://ww2.bgbm.org/herbarium/default.cfm>

BoGART – database of the BGBM's living collection

<https://ww2.bgbm.org/bogartdb/BogartPublic.asp>

LICHCOL – Lichen (& Fungus) Herbarium Database <https://archive.bgbm.org/scripts/ASP/lichol> [will be integrated into the BGBM Herbarium database in the JACQ system – see below].

DNA-Bank – information system for the BGBM's DNA collection (access via the portal of the Global Genome Biodiversity Network)

https://data.ggbn.org/ggbn_portal/search/result?institution=BGBM%2C+Berlin

MuseumPlus database of the BGBM in the Europeana Collections Portal

https://www.europeana.eu/en/search?query=europeana_collectionName%3A%2211635_OpenUp_MuseumPlus%22

2. TAXONOMIC INFORMATION SYSTEMS ON ORGANISMAL GROUPS

AlgaTerra – Information System on Terrestrial and Limnic Micro Algae (regularly updated)

<http://www.algaterra.net>

Cichorieae Portal – global online monograph of the *Cichorieae* (daisy family) (regularly updated)

<https://cichorieae.e-taxonomy.net>

Caryophyllales Portal – A global synthesis of species diversity in the angiosperm order *Caryophyllales* (regularly updated) <https://caryophyllales.org>

Phycobank – Registration system for nomenclatural acts of algae <https://phycobank.org>

3. FLORAS AND CHECKLISTS

Euro+Med PlantBase – The Information Resource for Euro-Mediterranean Plant Diversity (regularly updated)
<https://euoplusmed.org>

Med-Checklist – A Critical Inventory of Vascular Plants of the Circum-Mediterranean Countries (as published in book form) <https://ww2.bgbm.org/mcl>

Flora Hellenica Database (Arne Strid) <https://www.florahellenica.com>

Flora of Greece – An Annotated Checklist <https://portal.cybertaxonomy.org/flora-greece>

Flora of Cyprus – A Dynamic Checklist (online Flora of the vascular plants of Cyprus with illustrations, distribution maps and identification keys – regularly updated) <https://flora-of-cyprus.eu>

Flora of Cuba Database – Base de Datos de Especímenes de la Flora de Cuba – con Mapas de Distribución Versión 10.0 (2014) a Versión 11 (2016) (database of Cuban flora herbarium specimens with distribution maps)
<https://ww3.bgbm.org/FloraOfCuba>

Flora de Cuba en Línea <https://portal.cybertaxonomy.org/flora-de-cuba-en-linea>

The *Spermatophyta* and *Pteridophyta* of Cuba – A Preliminary Checklist
<https://portal.cybertaxonomy.org/flora-cuba>

Dendroflora de El Salvador <https://portal.cybertaxonomy.org/salvador/listado>

4. SERVICE PORTALS FOR COLLECTIONS DATA

VH/de – Virtual Herbarium Germany (digitised collections information from German herbaria)
<https://herbarium.gbif.de/de/>

GGBN – Global Genome Biodiversity Network <https://www.ggbn.org>

Botanic Garden Berlin Observations (BoBO) <https://bobo.biocase.org>

Caucasus Plant Biodiversity Initiative – specimen explorer with focus on Caucasian plants
<https://caucasus.e-taxonomy.net>

gardens4science – online collections catalogue for German botanic gardens <https://gardens4science.biocase.org>

5. WEB SERVICES

UTIS – Unified Taxonomic Backbone for the European Biodiversity Observation Network (EU BON)
<https://cybertaxonomy.org/eu-bon/utis/1.3/>

Name catalogue REST API (access to the data held in the databases of the EDIT platform, e.g. including the “Catalogue of Life”) <https://cybertaxonomy.org/cdmlib/rest-api-name-catalogue.html>

BioCAsE – Biological Collections Access Service (machine-readable access to the collections data of the BGBM)
<https://ww3.bgbm.org/biocase>

6. SOFTWARE

EDIT Platform for Cybertaxonomy – Open Source Software Tools and Services Covering All Aspects of the Taxonomic Workflow <https://cybertaxonomy.org>

BioCASE Network Software Components (for the networking and preparation of collections data in the BioCASE, GBIF and GGBN network) <https://www.biocase.org/products/index.shtml>

AnnoSys – Online annotation of biodiversity data <https://annosys.bgbm.fu-berlin.de>

JACQ Virtual Herbaria – Unified and jointly administered specimen management system for herbaria (in collaboration with the Natural History Museum and University of Vienna) <https://www.jacq.org/#collections>

Die Herbonauten – Das Herbar der Bürgerwissenschaften (botanical missions for citizen scientists) <https://herbonauten.de>

B-HIT Berlin Harvesting and Indexing Toolkit (software platform for the harvesting of dispersed collection and observation data) <https://wiki.bgbm.org/bhit>

MetBaN – Automated Pipeline for Metabarcoding Data Using Taxonomical/Phylogenetical Classification of Organisms <https://github.com/sproft/MetBaN>

70 7. ARCHIVED SYSTEMS

The following information systems are still available for consultation, but are no longer updated:

Bohlmann Files – A Database of Natural Substances in the *Compositae*. Access: n.kilian@bo.berlin

DERMBASE – Names of *Dermateaceae* (Ascomycetes) <https://ww2.bgbm.org/projects/dermbase/query.cfm>

IOPI-GPC – International Organization for Plant Information, Provisional Global Plant Checklist <https://ww2.bgbm.org/IOPI/GPC/default.asp>

Names in Current Use for Extant Plant Genera (NCU-3e) (standard list of generic names and publication citations for algae, fungi and plants) <https://archive.bgbm.org/iapt/ncu/genera/Default.htm>

IAPT Registration of Plant Names Trial (International Association for Plant Taxonomy's trial database for the registration of newly published plant names) <https://archive.bgbm.org/registration/QueryForm.htm>

EXTERNALLY FUNDED RESEARCH PROJECTS



FUNDING ORGANISATION	PROJECT TITLE	PROJECT MANAGERS	TERM
Alexander von Humboldt-Stiftung (AvH)	Grant for a research fellow from Peru	Thomas Borsch	2021–2023
Bundesministerium für Bildung und Forschung (BMBF)	GGBN-Tec – Technical and organisational measures for establishing the technical secretariat of the Global Genome Biodiversity Network (16LC2020A)	Anton Güntsch	2022–2026
BMBF	Pflanze KlimaKultur! – Citizen scientists investigate the effects of climate change on the development of plants in the city – TP FU Berlin (O1 BF2114A)	Gerald Parolly	2021–2024
BMBF	VVietBio – Innovative methods of recording biodiversity: capacity building with partner countries in Southeast Asia using the example of Vietnam	Thomas Borsch	2018–2022
Bundesamt für Naturschutz (BfN)	WIPs-De II – Reintroducing and supporting populations of endangered species for which Germany has a special responsibility (WIPs-De II) (FKZ 3518685B01)	Thomas Borsch/ Elke Zippel	2018–2023
Deutsches Zentrum Kultur-gutverluste	Provenance research at the BGBM library relating to cultural property confiscated as a result of Nazi persecution	Norbert Kilian	2021–2024
DFG	SPP 1158 – Biodiversity and biogeography of marine benthic diatoms in Antarctic and Arctic shallow water coastal zones to evaluate the degree of endemism using fine-grained taxonomy and eDNA metabarcoding (ZI 1628/2-1)	Jonas Zimmermann	2019–2022
DFG	SPP 1991 – The CARRARA Pipeline: Using machine-learning techniques for automated species delimitation in intensively hybridising plant genera based on herbarium specimens (VO 1595/4-1)	Robert Vogt/ Norbert Kilian	2020–2023

FUNDING ORGANISATION	PROJECT TITLE	PROJECT MANAGERS	TERM
DFG/NFDI	Nationale Forschungsdateninfrastruktur (DFDI) – NFDI4BioDiversität consortium – Biodiversity, ecology and environmental data (NFDI 5/1)	Anton Güntsch	2020–2025
Europäische Union (EU)	EU-Horizon 2020: IN-RADEV-02-2019-2020 – DiSSCo Prepare: Distributed System of Scientific Collections – Preparatory Phase Project (GA no. 871043)	Anton Güntsch	2020–2023
Europäische Union (EU)	EU-Horizon 2020: H2020-INFRAIA-2018-2020 – BiCIKL: Biodiversity Community Integrated Knowledge Library (GA no. 101007492)	Anton Güntsch	2021–2024
Europäische Union (EU)	TETTRIs: Transforming European Taxonomy through Training, Research and Innovations (GA no. 101081903)	Anton Güntsch	2022–2025
Europäische Union (EU)	SYNTHESYS PLUS – Synthesis of systematic resources, DE-TAF Access (Horizon 2020-INFRAIA) (GA Nr. 823827)	Robert Vogt	2019–2023
EU cost action	Formas: e-DNA research during JDS4 (Joint Danube Survey 4)	Jonas Zimmermann	2019–2022
Europäische Union (EU)	SYNTHESYS PLUS – Synthesis of systematic resources, DE-TAF Access (Horizon 2020-INFRAIA) (GA no. 823827)	Anton Güntsch	2019–2023
Kulturstiftung des Bundes	Connect – Comprehend – Communicate: Amazonia as a Future Laboratory	Thomas Borsch	2020–2023
Schwandt-Stiftung	Gardening and landscaping	Sylke Gottwald	2021–2025
Senatsverwaltung für Umwelt, Mobilität, Verbraucher- und Klimaschutz	Natur Bo Berlin: Initiierung eines umfassenden Bildungsprogramms für den Botanischen Garten Berlin	Thomas Borsch	2022–2023
Swedish University of Agricultural Sciences (SLU) Uppsala	Freshbar – Barcoding of freshwater taxa for improved assessment of biodiversity (FUB 2020000134)	Jonas Zimmermann	2019–2022
Verein der Freunde	Herbonauten III – Technical update and optimised maintenance of the herbarium platform for citizen scientists "Die Herbonauten"	Anton Güntsch	2022–2023
Verein der Freunde	Collecting trip to the island of Astypalea	Eckhard von Raab-Straube	2022

FUNDING ORGANISATION	PROJECT TITLE	PROJECT MANAGERS	TERM
Verein der Freunde	Grant for revising the Garden's North America plant geography area	Gerald Parolly	2021–2023
Verein der Freunde	<i>Cocconeis</i> California – Cultivation and examination of new <i>Cocconeis</i> cultures from California	Jonas Zimmermann	2022
Verein der Freunde	<i>Calligonum</i> – Nature protection genetics of the rare desert shrub <i>Calligonum bakuense</i>	Nadja Korotkova	2022
Verein der Freunde	<i>Philodendron</i> – Diversity of the genus <i>Philodendron</i> (<i>Araceae</i>) in Central America, collecting expedition	Nils Köster	2022
Verein der Freunde	<i>Centaurea</i> Greece – Funding for a collecting and research trip related to the research project on the phylogeny and taxonomy of the genus <i>Centaurea</i> (knapweed) in Greece	Norbert Kilian	2022
Verein der Freunde	Lichens from Brunei	Robert Lücking	2022
Verein der Freunde	Flora of Cuba	Thomas Borsch	2022
Verein der Freunde	<i>Dianthus</i> Greece	Thomas Borsch	2020–2020
Verein der Freunde	Flora von Kuba Online	Walter Berendsohn	2022

COLLECTIONS

LIVING COLLECTION



HOLDINGS	2021	2022
Families	318	311
Genera	3,304	3,242
Taxa (species, subspecies, varieties etc.)	18,800	18,417
Accessions	32,640	32,713
Wild provenances (in %)	59.94	59.63

ARRIVALS/RELEASES	2021	2022
Accessions	1,585	744
Deaccessions	896	1,671

RELEASE OF MATERIAL	2021	2022
Total release of material, accessions	697	659
Total release of material, plant (parts)	4,287	6,116
Accessions to other gardens	350	287
Plant (parts) to other gardens	675	503
Accessions for teaching	166	221
Plant (parts) for teaching	3,163	4,403
Accessions for research	141	113
Plant (parts) for research	312	537
Schools accessions	40	38
Schools plant (parts)	137	673

DAHLEM SEED BANK	2021	2022
Holdings, number of accessions	13,912	14,266
New additions, number of accessions	474	354
projects	177	121
long-term storage (Base Collection)	207	80
Index Seminum (Access Collection)	90	153
Inclusions in the Index Seminum, of which	3,557	3,866
seed samples sent out	861	375
domestic	270	236
international	591	139
Recipients of seed samples	50	22

COLLECTIONS

HERBARIUM

HOLDINGS	2021	2022
Total number of specimens	3,95 m	3,95 m
Type specimens	>40,000	>43,000
Garden herbarium	52,223	52,550
NEW ADDITIONS	2021	2022
Total new additions, of which	18,500	17,952
through donation	16,580	7,069
through exchange	1,440	637
through purchase	100	6,268
through our own collecting activities	271	3,978
New additions to the garden herbarium	244	327
LOANS, EXCHANGES, VISITORS	2021	2022
Loan requests	200	198
Loans from the Herbarium Berolinense to other institutions		
Number of specimens	1,714	2,293
Number of shipments	85	33
Loans to the Herbarium Berolinense from other institutions		
Number of specimens	4,806	2,650
Number of shipments	22	26
Number of institutions with which we had loan – exchanges	139	135
Specimens permanently given to exchange –partners	979	649
Visiting scientists	34	74
DIGITAL HERBARIUM	2021	2022
Newly digitised specimens, of which	39,155	32,824
as a result of loan requests	1,622	1,372
in the context of projects	37,533	31,452
Total number of specimens available online	678,370	711,194
Hits/downloads	130,213	168,456
DNA BANK	2021	2022
Holdings (number of DNA samples)	43,125	>44,000
New additions through our own research activities	1,889	c. 1,000
DNA samples sent out (number)	54	119
DNA samples sent out (recipients)	9	12

LIBRARY



HOLDINGS AND CATALOGUES	2021	2022
Monographs and journal volumes	218,854	220,143
Current journals with print editions	515	533
Offprints	145,030	145,204
CD-ROMs, DVDs and video cassettes	508	510
Microfilm and microfiche titles	4,178	4,178

NEW ADDITIONS	2021	2022
Monographs	751	788
through purchase	391	254
through exchange/purchase	360	534
Bound journals	570	487
through purchase	115	138
through exchange/purchase	455	349
Offprints	176	174
CD-ROMs and DVDs	5	2
Expenditure on contributions to databases and online journal packages	€ 10,513	€ 36,541

BGBM PRESS: PUBLICATIONS

WILLDENOWIA

Willdenowia 52(1) <https://bioone.org/journals/willdenowia/volume-52/issue-1>

Willdenowia 52(2) <https://bioone.org/journals/willdenowia/volume-52/issue-2>

Willdenowia 52(3) <https://bioone.org/journals/willdenowia/volume-52/issue-3>

ANNUAL REPORT

Jahresbericht 2020 – 2021. Botanischer Garten und Botanisches Museum Berlin. – <https://doi.org/10.3372/JB.2020-2021.de.1>

Annual Report 2020 – 2021. Botanic Garden and Botanical Museum Berlin. – <https://doi.org/10.3372/JB.2020-2021.en.1>

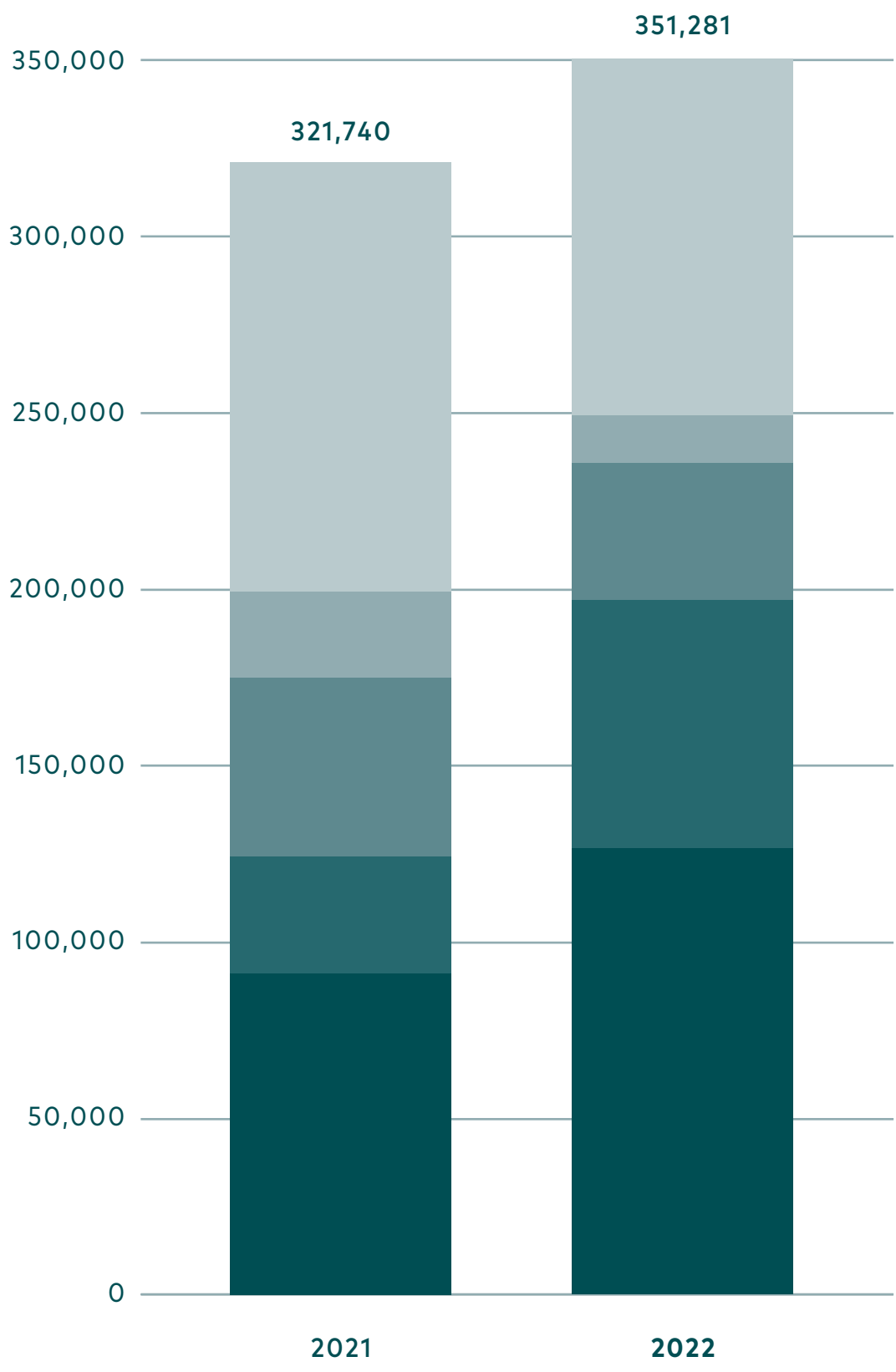
OTHER PUBLICATIONS

Burkhardt L. 2022: Eine Enzyklopädie zu eponymischen Pflanzennamen: Von Menschen & ihren Pflanzen – Berlin: Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin. – <https://doi.org/10.3372/epolist2022>

Greuter W. & Rankin Rodríguez R. 2022: Plantas Vasculares de Cuba. Inventario. Tercera edición, actualizada, de Espermatófitos de Cuba. Vascular Plants of Cuba. A Checklist. Third, updated edition of The Spermatophyta of Cuba. – Berlin: Botanischer Garten und Botanisches Museum Berlin; La Habana: Jardín Botánico Nacional, Universidad de La Habana. – <https://doi.org/10.3372/cubalist.2022.1>

Greuter W., Rankin Rodríguez R. & González Gutiérrez P. A. (ed.) 2022: Flora de la República de Cuba. Serie A, plantas vasculares. Fascículo 27. *Montiaceae. Portulacaceae. Simaroubaceae. Talinaceae. Ulmaceae.* – Berlin: Botanischer Garten und Botanisches Museum Berlin, Freie Universität Berlin. – <https://doi.org/10.3372/frc.27.0>

VISITOR NUMBERS

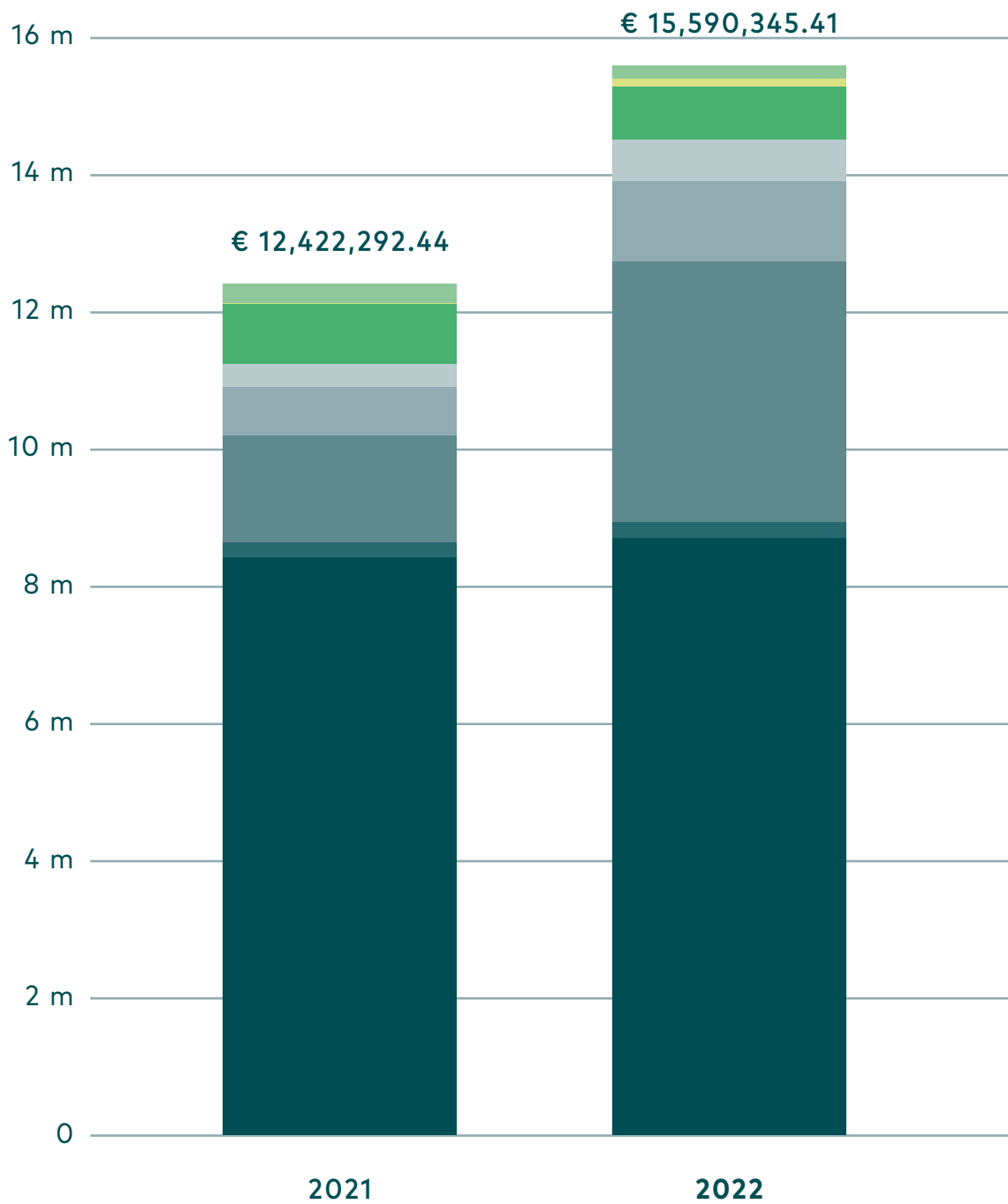


ENTRY

- STANDARD
- CONCESSIONS
- WITH ANNUAL PASS
- FREE *
- EVENTS

* e.g. small children or students on relevant courses

BUDGET



- State grant, consumption*
- State grant, investment
- GRW investment grant**
- Income (entrance fees)
- Income (events, hires)
- External funding***
- Donations, other contributions
- Bequests

* Since 2018, the state consumption grant has included special funding from the Institutional Contract (Sondertatbestand Hochschulvertrag) as well as €200,000 from FU Berlin central funds to compensate for the tariff-related additional costs of the former BGBM operating company.

** GRW is the national scheme for improving regional economic structures.

*** BMBF, BfN, DFG, EU, VolkswagenStiftung, among others.

Publication information

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#welcome