

THE WORLD IN A GARDEN



BG | Botanischer Garten &
BM | Botanisches Museum
Berlin

BGBM Annual Report
2012 – 2014

Freie Universität



Berlin

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A

Introduction

Berlin's Botanic Garden and Botanical Museum is an institution with a rich heritage stretching back over more than three centuries. It boasts important collections, a fundamental role in the international network of scientific institutions involved in botanical evolutionary and biodiversity research, and impressive parkland and greenhouses providing a place of relaxation and culture in Berlin. While this 'Green Oasis' is familiar to many Berliners, its enormous national and international importance as a scientific institute is less well known. The aim of this brochure, therefore, is not only to report on our activities in the years 2012 to 2014 but also to give readers a glimpse behind the scenes.

During the years 2008 to 2012, the BGBM underwent an intensive process of organisational and structural development. These fundamental changes are key to making the institution viable for the future and ready to face the raised expectations of society and politics. Central to this are our three closely related fields of activity: first, research and teaching in accordance with the core functions of a university; second, regional, national and international biodiversity programmes; and third, educational provision in the field of botany and the environment, coupled with the upkeep of a listed cultural asset and the development of an exceptional place of recreation. It is important that all three fields of activity enjoy equal status and are of mutual benefit. Taken together, the collections are the prerequisite for fulfilling all these tasks and being able to execute them to a high standard. As a 'central facility' of Berlin's Freie Universität (Free University), the Botanic Garden and Botanical Museum Berlin-Dahlem is the largest university-level natural history research collection in Germany and, as such, occupies a very special position. With 20,000 cultivated plant species and more than 3.7 million specimens, the living collections and the herbarium are not only the most extensive in Germany but among the most important in the world.

The first field of activity is concerned with pure research and higher-level education, whereas the questions and goals of the second field of activity, biodiversity programmes, are more firmly rooted in practice: here, applied research is undertaken in order to provide the scientific basis for the protection and sustainable use of biodiversity. Our activities in this field range from science via policy advice to concrete measures and projects, such as preserving genetic resources from wild plants. Both regional and international collaborations and institutional partnerships are therefore to be even more strongly encouraged, the BGBM seeing itself as a research partner in the field of plant biodiversity and evolution. In this context, the digitisation and cataloguing of our collections in particular are to be systematically expanded.



Prof. Dr Thomas Borsch

Director of the Botanic Garden and Botanical Museum Berlin

The third field of activity involves further improving the experience for visitors, especially tourists. As a place that appeals to all the senses, a botanic garden cannot surely fail to inspire and delight a wide range of target groups. The modern visitor information system that was introduced with the renovation of the Main Tropical Greenhouse must now be extended to the whole garden, and what BGBM offers needs to be more strongly integrated into what Berlin as a whole offers in terms of culture and tourism. To this end, we have also set ourselves the task of strengthening cooperation with other institutions in Berlin.

I extend my heartfelt thanks to all the staff at the Botanic Garden and Botanical Museum Berlin for their commitment and passion, to all funding agencies and sponsors. In the hope this report gives you interesting insights into the work that we do, I wish you all an enjoyable read!

Sincerely,
Thomas Borsch



B

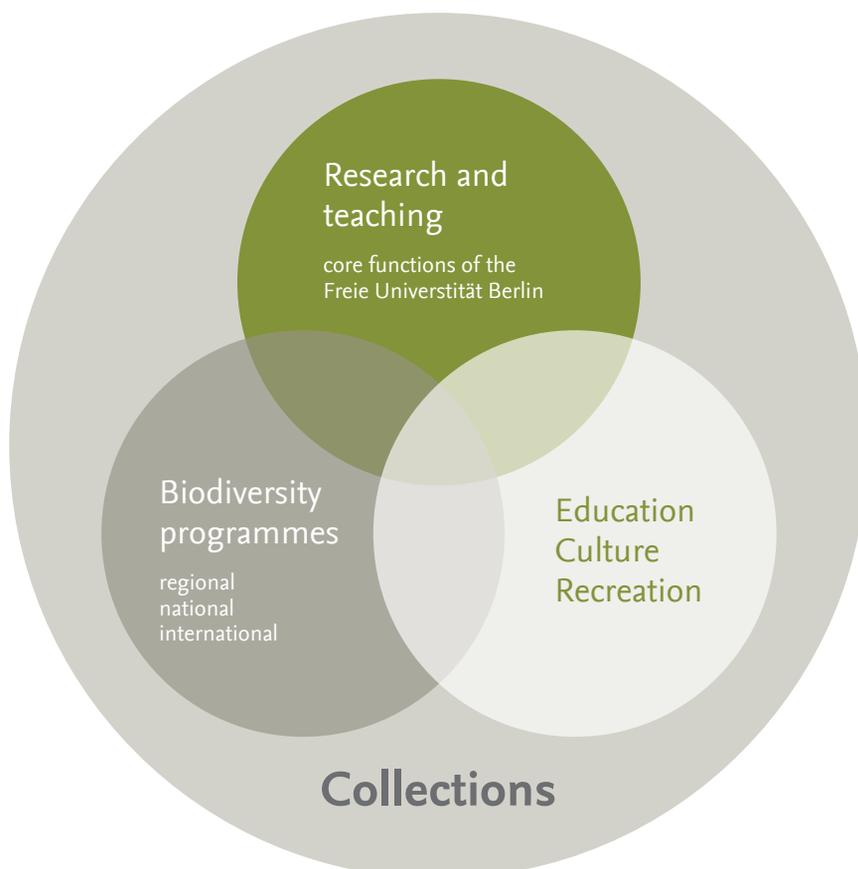
BGBM at a Glance

The Earth's natural plant diversity is our thing. We document it in our collections, record and explore it in our research projects, and contribute to its protection and sustainable use. The extensive plant collections of the Botanic Garden and Botanical Museum are of global importance. More than 20,000 different plant species are cultivated in the garden, and the herbarium contains over 3.7 million specimens with some 40,000 type specimens: unique originals by reference to which plant species are first described and their scientific names established, in other words a kind of 'standard measure'. In addition to this, there are also valuable historical collections, such as part of the botanical collection assembled by Alexander von Humboldt in Latin America. Last but not least, we have here one of the largest libraries of botanical literature in Europe. These collections, together with modern research infrastructure and scientific expertise, make our institution both a point of contact and a key player in international biodiversity research.

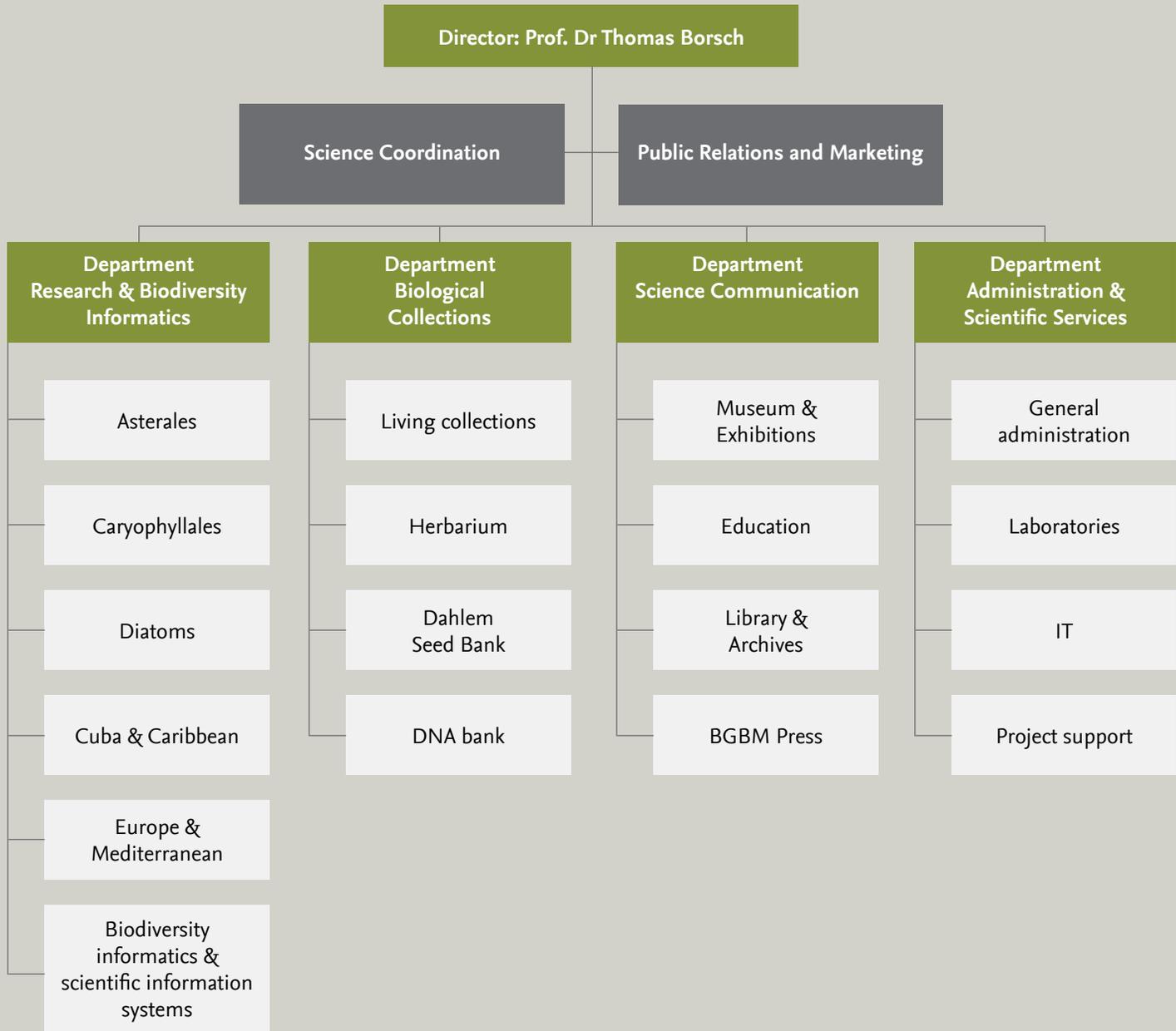
A unique feature is the conjunction of Botanic Garden and Botanical Museum. The large outdoor areas and greenhouses, stocked with

plants from all over the world, are complemented by the museum treatment of current topics in botany. To highlight this feature, both elements form part of the name: Botanic Garden and Botanical Museum Berlin. Since this name is a little long for use in everyday speech, the abbreviation BGBM has been coined.

The inextricability of garden and museum is both indispensable for researchers and of particular interest to visitors. Our visitors can experience and enjoy the entire plant kingdom here in an artfully designed setting.



The BGBM's activities are grouped into three areas – research and teaching; biodiversity programmes; education, culture and recreation. All three are rooted in the collections.



Organigram of the BGBM central facility

C

Organisation

The Botanic Garden and Botanical Museum's range of activities goes far beyond the core university functions of research and teaching. It also includes the development, care, preservation and expansion of its collections. The BGBM is both an educational establishment and a place of recreation, thus occupying a special, overarching position as a 'central facility' within Berlin's Freie Universität.

In order to manage the Botanic Garden and Botanical Museum's diverse areas of responsibility effectively, improvements were made in 2012 to the central facility's organisational structure (see organigram). These structural changes were fundamental to ensuring the institution's future viability. The reorganisation has created management structures that are not only practicable and transparent but also speed processes up.

One of the most important goals of the reorganisation was the creation of workable areas of responsibility. The entire institution and its staff were involved in the conception and implementation of both the strategy and its formulation. The entire development process was closely followed by the various stakeholders, and strengths as well as weaknesses were identified in employee focus groups. The result of these participatory changes is a fresh-faced organisation with structures steeped in tradition.

Thus, even by the standards of other botanic gardens, such as the Royal Botanic Gardens, Kew, or the New York Botanical Garden, the BGBM is ready to face the future.





Department Research and Biodiversity Informatics

The BGBM's research department punches well above its weight. More than 30 scientists work in six different research and development groups. Under the leadership of Professor Dr Walter Berendsohn, research is undertaken that is concerned with current botanical topics and at the same time also relates to pressing social issues. Discoveries in biodiversity, studies on geographical diversity patterns, and advances in understanding evolutionary history are all made here. The various research groups focus on specific geographical areas or particular plant groups, the question of biodiversity and its preservation always being central. Last but not least, we also see ourselves as a service provider, believing the provision of data to be an important aspect of international research. Which is why a further area of focus is the indexing, networking and visualisation of scientific data and collections.

Department Biological Collections

The BGBM's collections are historical and at the same time part of current research. They consist of the most diverse building blocks and, taken together, are an important piece in the institution's overall mosaic. Several sub-collections are united under the leadership of Professor Dr Albert-Dieter Stevens: the Dahlem Seed Bank, which preserves seeds of wild plants; the living plants in the greenhouses and in the open air; the herbarium; and the DNA bank. Initially aimed at creating global collections of all 'plant groups', the institutional collecting policy is now particularly geared towards those key areas that are closely related to our research programmes. Together, they not only constitute a central archive of biodiversity, but are also an important resource for research both nationally and internationally. The union of these sub-collections at a single location is essential as it allows modern integrative research approaches (e.g. documentation of the living material in the herbarium, etc.) to be followed according to modern-day standards.



Department Science Communication

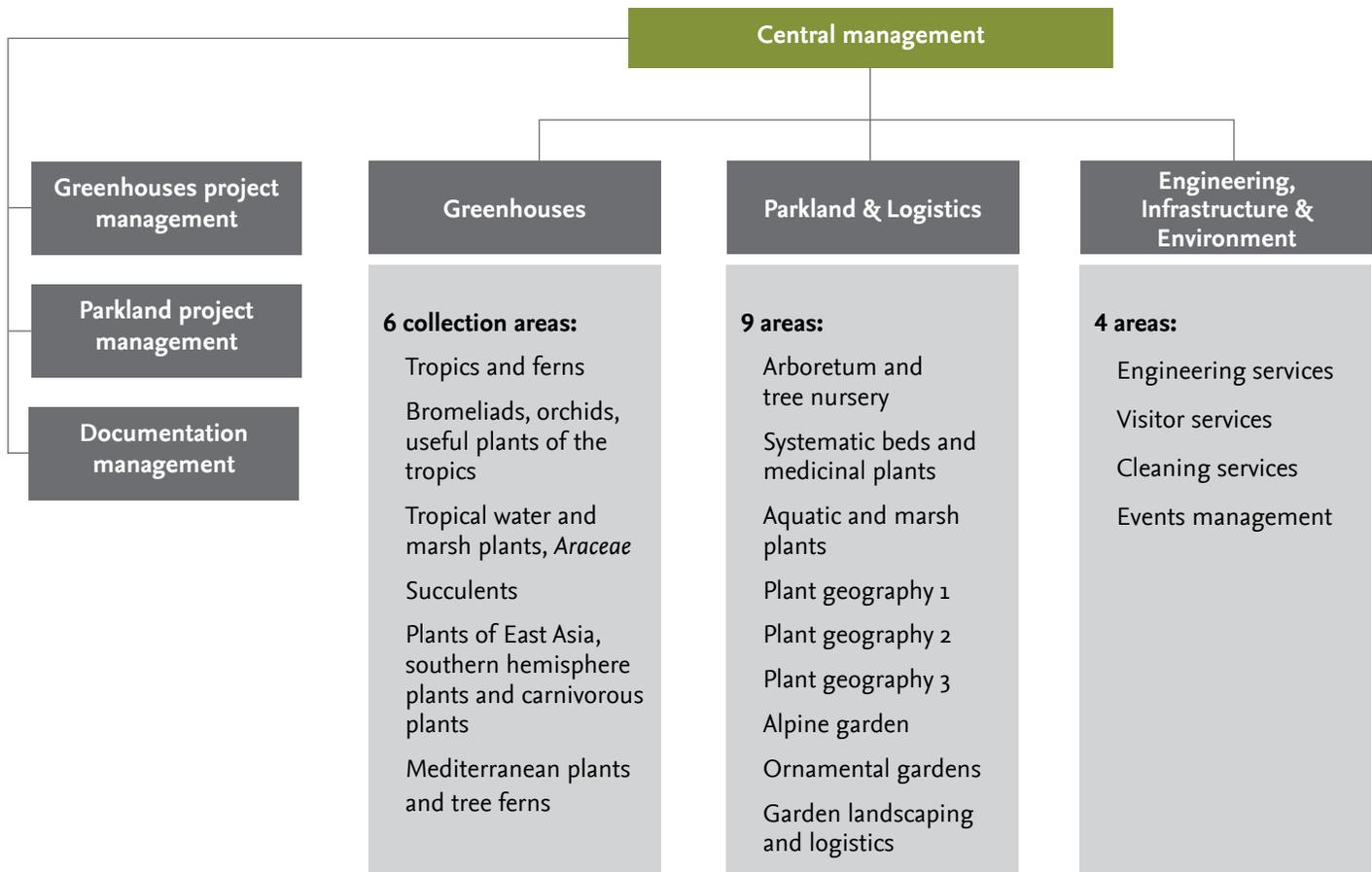
It is easy to arouse short-term enthusiasm for green issues, which are experienced on an emotional level and have contemporary relevance for many people. But it is only sustained interest that is effective, which is why the department's role is a particularly challenging one. The department is concerned with the communication of knowledge at various levels – it has an impact on specialist audiences, but is also aimed at the general public. Several sections are united under one umbrella: Museum & Exhibitions; Education; Library & Archives; and BGBM Press, the in-house publisher. BGBM Press publishes the series *Willdenowia* and *Englera*, which meet the high scientific standards expected of botanical-taxonomic publications. Another important function of the department is the management of published data rights in the context of international cooperation. Additionally, the Botanical Museum is responsible for communication to the general public. While a botanical museum is itself a peculiarity in the international museum landscape, the Berlin Botanical Museum's understanding of the exhibition concept is unique in being broad enough to include the garden as well. Last but not least, the department is in charge of education and of imparting botanical expertise. This manifests itself in guided tours, events and collaborations within the university or with the BGBM Association of Friends and plays its part in all the institution's departments.

Department Administration and Scientific Services

Science is always involved in processes carried out by the Administration and Scientific Services department, headed by Sylke Gottwald, which is concerned with general administration and the management of the budget. To this end, the department performs key cross-sectional tasks for the entire institution. It is responsible for the technical management of the laboratories and the IT systems. Also operating under this same umbrella is a team whose job it is to support scientific projects with the specific requirements of collection-based research typical to the BGBM. This is important because an extraordinary number of projects and scientists at the BGBM are financed through external funds. The laboratory service allows a large number of samples to be analysed in the laboratories and puts at the disposal of researchers the very latest in technology, from electron microscopy to genomics. The infrastructure is highly attractive not only for our own researchers but also for many visiting international scholars and is a prerequisite for the competitiveness of our research and for the scientific use of our collections. High demands are thus placed on the department that differ significantly from the requirements of other departments.

The scientific and administrative departments of the central facility are complemented by the so-called *Gemeinschaftsbetrieb* (joint operation). The *Gemeinschaftsbetrieb* of the Botanic Garden and Botanical Museum, in which employees of the Freie Universität Berlin and the *Betriebsgesellschaft* (operating company) for the BGBM (GmbH) are jointly active, provides all the services required to run the garden and museum.

These include, above all, the cultivation of the plants and the upkeep of the grounds. It takes many hard-working people to look after a total area of 43 hectares with over 20,000 plant species: depending on the season, 100–120 staff are employed in the Greenhouses, Parkland & Logistics as well as the Engineering, Infrastructure & Environment operating units, headed by Karsten Schomaker.



Organigram of the *Gemeinschaftsbetrieb*

A garden full of people

Profiles of a few of our staff

Whether as part of the central facility of Berlin's Freie Universität or as employees of the Gemeinschaftsbetrieb, around 240 people in total work for the Botanic Garden and Botanical Museum Berlin.

Prof. Dr H. Walter Lack Lack is an internationally renowned expert on the history of plant taxonomy, the botanical research exploits of Alexander von Humboldt, and botanical illustration. Up until 2014 he was head of the Science Communication department at the Botanic Garden.



INTERVIEW

Gold for green

The Linnean Society of London recently awarded you the Linnean Medal for your life's work. When you look back at what you have achieved, what are you particularly proud of?

My work is unusual for a biologist in that I've never confined myself to a particular area. I've always had very diverse interests. Thus my research on the horse-chestnut leaf miner, a small butterfly, for example, was widely read and cited. And yet insects are not among my principal research interests. I am particularly proud of a frequently quoted, fundamental study of the flora of Greece, Cyprus and western Turkey.

You studied biology in Vienna and, on completion of your doctorate, took up a scientific post at the Botanic Garden and Botanical Museum in Berlin. What were your duties?

At first I was only responsible for one section of the herbarium. But my area of responsibility rapidly grew, and I soon took charge of the institution's publications and its very extensive library. That's how I became involved with the history of biodiversity research. In biology, it is absolutely essential that organisms are given a precise designation. There is an international agreement that the oldest name of a plant has to be used. This means having to go back to 1 May 1753, the day on which Linnaeus (or Carl von Linné as he was then) introduced the system of binomial nomenclature: since then the name of each species has been made up of two elements, the genus name and the species epithet – as for example *Homo sapiens* for modern humans. As a consequence of this role, I also had to address what the current state of knowledge was,

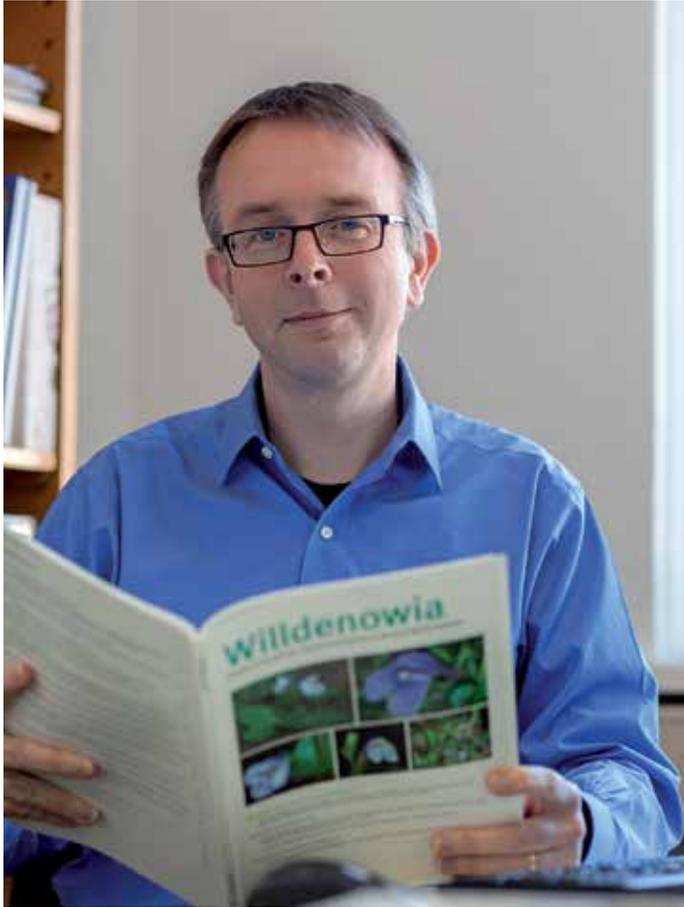
where the collections were, and which destinations researchers were heading to.

Alongside the history of botany, you have also been heavily involved with botanical illustration. Now that photography is so technologically advanced, do we still need scientific artists?

Just think about the complexity of an orchid flower. An artist is able to represent this, as well as sections and different planes. Even today a photo is still inferior to a drawing. Lifelike illustrations give a very quick and effective impression of a plant; you can rapidly identify a plant's essential characteristics – better than in a long text.

You're now retiring after 39 years spent working at the Botanic Garden and Botanical Museum. How will you maintain your connection with plants in the future?

I am currently working on a book about the Bauer brothers (Josef, Franz and Ferdinand), three major botanical illustrators. I want to finish this, and I'm preparing the odd lecture as well. I'm also looking forward to having more time for my garden and my four grandchildren.



Nick Turland has already had experience of a number of botanical institutions, and we are delighted that he could be won for the Botanic Garden Berlin. After international postings at the Natural History Museum, London, and the Missouri Botanical Garden, he came to Berlin in 2013. In addition to his interest in plant diversity, especially in the flora of Greece, it is his expertise in biological nomenclature that makes him so ideally suited to this role. Nick is head of BGBM Press and editor of the journals *Willdenowia* and *Englera*.



Biodiversity data and network are terms with which the BGBM's **Gabi Dröge** is synonymous. Since 2008, she has been engaged in various data gathering and networking projects, and even in her spare time develops tools that the scientists gladly make use of. Since 2012 she has been permanently employed in the Biodiversity Informatics research group and supports the development of a global network of DNA banks.



It is said that camellias are the roses of winter. No one is better placed to confirm whether this is really true than the camellia gardener **Josef Wyrwis**. Over many years he has become an expert in their care and cultivation. In 2013 he celebrated his fortieth anniversary at the Botanic Garden. Congratulations, Josef!



Often it is the hard work going on in the background that makes all the difference. At the BGBM, it is crucial that visitor services are run as smoothly as possible because only then are visitors totally satisfied. **Annika Holzki** has a big part to play in this. Since 2013, Annika has managed a section of visitor services. She must have already proved herself before that, though, because the transition to the new till system in 2012 went ahead seamlessly with her help.



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Scanning Microscope

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Research

The BGBM is an institution with a distinguished past that conducts future-oriented research. Our research leads to **scientific insights and principles** that are necessary for the **conservation and sustainable use of biological diversity**. This is how we make our contribution to key challenges facing society.

The global plant diversity collections are an important basis for many research projects, the special combination of herbarium, DNA bank, seed bank and living collection providing excellent conditions for integrative research approaches. Our labs are equipped with cutting-edge technology, making it possible to produce and analyse molecular-biological and genomic data as well as investigate the ultrastructure and micromorphology of plants. Evolutionary biology, digitisation and computer science are currently revolutionising the recording and classification of organisms. We continue to develop **integrative taxonomy** methods and set priorities by studying different model-groups of organisms (flowering plants, diatoms). An essential contribution is made by our Biodiversity Informatics research and development group. This team of computer scientists and biologists has been producing pioneering work in this field for more than two decades.

Our research similarly has a **geographical orientation**: the main areas of focus are, on the one hand, Europe and the Mediterranean as far as the Caucasus, and, on the other hand, the Caribbean and Latin America. We are also active in East Africa and China. Together with our local partners, we record and investigate the plant diversity of these regions. In the process, fundamental new insights are gained – not only in the exotic parts of the world, but also in central Europe. We publish our research and data in publications, databases and web portals, as they are the basis for many other research topics and applications. Building on our expertise regarding the diversity of organisms, these are some of the questions that are addressed: How did today's plant diversity, for example in

the Caribbean or in the Caucasus, come into being in the course of evolution and geological history? What natural and anthropogenic factors determine the current distribution and diversity of plants? What future changes should we expect as a result of climate change? What strategies augur well for the survival of endangered or rare species in the long term? We follow up many of these issues in interdisciplinary projects together with experts from geography, social and human sciences.

The use, expansion and preparation of the scientific collections have played a central role in research at the BGBM. Furthermore, the development of our profile is geared towards long-term **cooperation and institutional partnerships** at home and abroad. As a result, our institution has been established at national and international levels as an important and reliable partner for both basic and applied research. Our research findings support the recording and preservation of biodiversity in Germany and numerous other countries, thus contributing to the implementation of the national biodiversity strategy. Through regular exhibitions and the different forms of communication associated with them, we give our visitors the opportunity to see and experience these topics, tasks and results.

Bellflowers

Evolution und integrative taxonomy



By way of example, a few individual projects selected from the wide variety of our research programme are described here. Biodiversity and its conservation are themes that are common to all of them.

The bellflower family (*Campanula* and related genera) is one of the most species-rich groups of flowering plants in Europe, the Mediterranean and the Caucasus. Many species are limited to a very small distribution area (so-called endemics); others by contrast occur widely, with often morphologically divergent populations found in different geographical areas. To better understand the evolution of species diversity and species boundaries in a plant group such as this, a comparative analysis of thousands of individuals has to be conducted at a continental level. Such research questions can only be addressed in teams, with large amounts of very diverse data and collection material being generated (e.g. herbarium specimens, images, texts, DNA samples).

It is therefore essential that appropriate work- and data-flows are established that allow the research results and information to be comprehensively indexed, comparatively analysed and evaluated. Research process and data management must be closely coordinated. Using the example of the current *Campanula* project, a data portal is being developed that aims precisely to meet these requirements. With the online publication of the collection items, data for the species and metadata for the items, and the latest research results, knowledge is made available to a wider community of researchers. Furthermore, in the context of these digitisation initiatives, workflow- and standardisation proposals are made that in turn have a knock-on effect on current research projects. The end result is an integrated taxonomic workflow system.

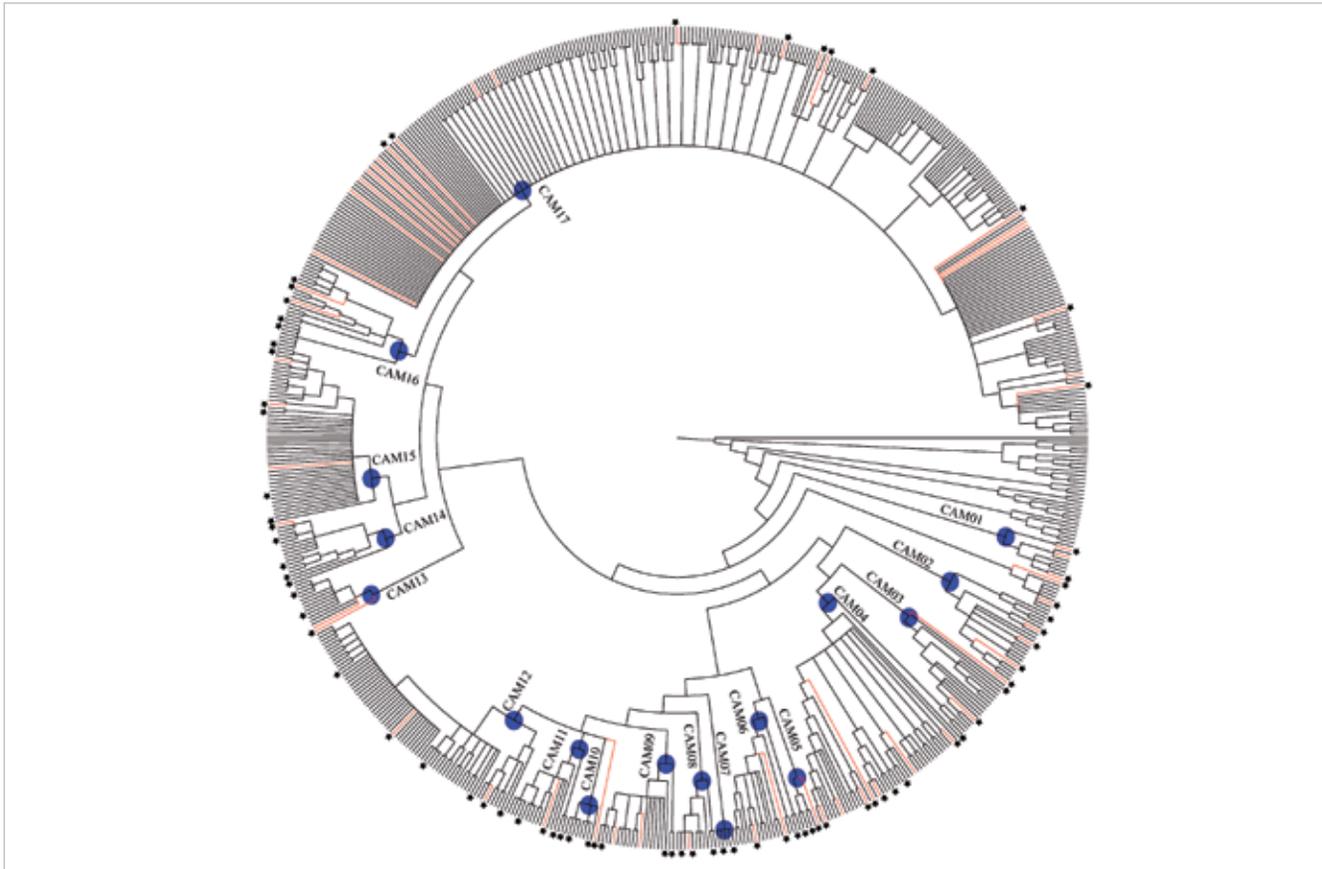
Sample project: Development of a subject indexing system for collections of the northern hemisphere flowering plant genus *Campanula*

Project leader: Dr Norbert Kilian

Duration: 2012 – 2015

Supported by: DFG

Cooperation with: University of Münster



Modern evolutionary research methods make it possible to generate and evaluate large data sets. This figure shows a phylogenetic analysis of 680 samples of the *Campanula* genus, representing most *Campanula* species. For each sample, a small section of the chloroplast genome has been sequenced (after Mansion & al. 2012: How to handle speciose clades? Mass taxon-sampling as a strategy towards illuminating the natural history of *Campanula* (*Campanuloideae*). PLoS ONE 7(11): e50076).

Biodiversity informatics deals with the recording, long-term storage, publishing, networking and modelling of biodiversity data. The BGBM is one of the leading institutions in this field, and has its own research and development group, which is not only vital for the electronic processing of our own collection and research data. Rather, for many years this working group has been developing workflows and software for managing biodiversity information and data that have become internationally recognised scientific standards, and have been used for many projects and products. These include, for example, the 'EDIT Platform for Cybertaxonomy' and the 'Biological Collection Access Service' (BioCASE). Using these software tools, we make various information systems and databases, such as the general list of European vascular plants (Euro+Med PlantBase) or the *Cichorieae* Portal, permanently available, and develop them further. Increasingly, they are also being published on machine-readable interfaces, so-called 'web services'.

Biodiversity informatics
New standards for the
management of biological
data

Sample project: **Biodiversity Virtual e-Laboratory**

BGBM project leader: **Anton Güntsch**

Duration: **2011 – 2014**

Supported by: **EU (7th framework programme)**

Cooperation with: **14 partner institutions from 9 EU countries**

Sample project: **German Federation for Biological Data, GFBio**

BGBM project leader: **Anton Güntsch**

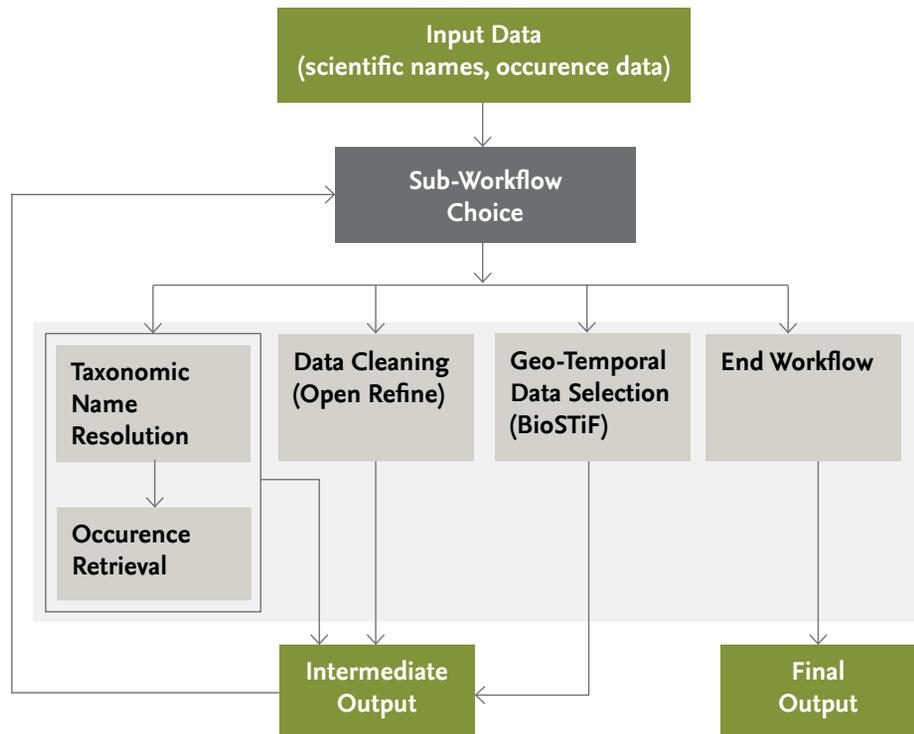
Duration: **2013 – 2015**

Supported by: **DFG**

Cooperation with: **20 partner institutions from across Germany**

For the EU BioVeL (Biodiversity Virtual e-Laboratory) project, the research and development group produced an effective tool to prepare data for an analysis of past and present species distribution. This so-called ‘data refinement workflow’ brings together numerous web services into a single, user-friendly web interface, and has already been used successfully in several research projects. It also forms the basis for our work package in the current, nation-wide collaborative project ‘German Federation for Biological Data’ (GFBio). The aim of this project is to link up data systems developed for biodiversity researchers and collecting institutions with other environmental and ecological research areas, thus creating an integrated data infrastructure that can be used over the long term.

At first sight, such workflows seem straightforward. In practice, however, they soon become complicated, since large quantities of data tend to be involved, as well as many scientists. We have now developed a web application that makes it possible to prepare complex biological data efficiently for use in various types of research. (Mathew & al. 2014: A semi-automated workflow for biodiversity data retrieval, cleaning, and quality control. Biodiversity Data Journal 2: e4221).





The first step in investigating plant life in Cuba is to collect plants in the wild. German and Cuban scientists regularly take part in joint expeditions.

Our regional research programme 'Cuba and the Caribbean' is devoted to a global biodiversity hotspot. Cuba, the largest of the Caribbean islands, is a key focus of our research. There are more than 7500 vascular plant species in Cuba, of which over half are endemic to the island, i.e. they occur there and nowhere else. This uniqueness has, up to now, been the subject of very little research, and is also very much under threat. Natural habitats, for example, have been cleared to make way for the cultivation of sugar cane or for mining, and recently new threats have emerged, in the form of invasive species and climate change. In the last few years, a system of conservation areas has been established to address these problems. For this, an up-to-date Flora of Cuba is urgently needed. Only then will it be possible to identify plant species and take effective conservation measures.

Cuba and the Caribbean
Working together to
understand biodiversity
in the region



Under the leadership of the BGBM, a network of German and Cuban scientists are working together to investigate Cuban flora. This work involves, firstly, production of a *Flora de la República de Cuba*, which is progressing rapidly. Between 2012 and 2014 alone, under the editorship of Werner Greuter and Rosa Rankin, four volumes were published, giving a thorough description of ten plant families (from *Lauraceae* to *Buxaceae*). Much, however, remains to be done, since so far, even with these new volumes, only a third of Cuban flora has been described. It is particularly important, moreover, to include taxonomic, evolutionary, biological as well as biogeographical approaches to gain a better understanding of plant diversity. Every year, joint expeditions are organised, as well as a workshop at the Jardín Botánico Nacional in Havana, which acts as a forum for exchanging the latest findings.

All in all, the Cuban Flora project has turned out to be one of the smoothest running projects of its kind worldwide. The key to its success is an integrated approach involving basic research, academic and technical training and exchange ('capacity building'), and working closely together, all of which feeds into the publications. It is therefore now held up as a prime example of fruitful, long-term cooperation between institutions. In recent years, we have extended this successful arrangement to other countries in the Caribbean, Central America and Mexico, since the evolution of plant diversity in the Caribbean area cannot be understood without comparative analyses of organisms throughout the region. Our team therefore also includes several scientists from the Universidad Nacional Autónoma de México (UNAM, Mexico) and the Jardín Botánico Nacional de Santo Domingo (Dominican Republic).



Buxus koehleri is one of three Cuban box tree species that were newly described in 2013. There are in total around 40 different types of box tree in Cuba, most of which occur nowhere else in the world.

Sample project: **Flora de Cuba and endemism in Cuba and the Caribbean**

Project leaders: **Dr Susy Fuentes & Prof. Dr Thomas Borsch**

Duration: **2012–2013, 2013–2014, 2014–2015**

Supported by: **Association of Friends of the BGBM**

Cooperation with: **National Botanic Garden of Havana, Cuba, and with other partner institutions in Cuba and the Caribbean**

Diatoms are tiny unicellular organisms, invisible to the naked eye. However, they have huge ecological significance. The more than 100,000 species of diatom are present in vast numbers in the world's water bodies, and produce around a quarter of our planet's oxygen. The various stretches of water each have their own characteristic make-up of diatom species, highly dependent on the nutrient, acid and salt content of the water.

Diatoms are extremely sensitive to water quality. This makes them ideal bioindicators for determining this quality, as is regularly required by the EU water framework directive. To this end, diatoms living in the substrate, forming a slippery film of slime on stones or on the bed of the water body, are collected and examined in a laboratory. Up to now, this has been done using an optical microscope and morphological determination of the diatom species, from which conclusions can be drawn as to water quality. However, many of the distinguishing characteristics are difficult to identify using an optical microscope, and often only experts can classify the species in question. To resolve this problem, scientists from the Diatom research group have worked together with colleagues from the Leibniz-Institute of Freshwater Ecology and Inland Fisheries and from Cologne and Giessen Universities to test out a new method for water quality analysis. Using environmental DNA metabarcoding (eDNA metabarcoding), classifying species with

Diatoms Revolution in water quality analysis

the help of defined DNA sequences, they were able, when comparing the Oder and Lusatian Neisse rivers, to identify three times as many species as when using the traditional morphological identification system. eDNA metabarcoding, therefore, allows for far more objective and detailed investigations, which have the potential to revolutionise water quality analysis. First, however, this new method must be still further developed, so that it can be applied cheaply and quickly. It is also vital to further expand the reference database used to classify the DNA sequences obtained from the environmental samples. In parallel to the DNA analysis, an electron microscope was also used at the BGBM to reassess and clear up any errors in the diatom reference database. By combining these methods, new species of diatom can also be discovered in central European waters and described scientifically.

Sample project: **Design and evaluation of DNA-barcoding high-throughput methods for analysing diatom diversity – a test case along a south-north gradient in central Europe (Rivers Neiße/Oder)**

Project leader: **Dr Regine Jahn**

Duration: **2011 – 2014**

Supported by: **DFG**

Cooperation with: **Justus Liebig University Giessen, University of Cologne, Leibniz-Institute for Freshwater Ecology and Inland Fisheries**



Above: Assessing water quality requires not only scientific knowhow, but often also dexterity and weatherability when taking samples. This picture shows Dr Jonas Zimmermann at the River Oder in Frankfurt.

Left: A water sample showing various species of diatom, seen through an optical microscope.

The Euro+Med PlantBase

Fundamental knowledge for the conservation and sustainable use of plant diversity

Sample project: Euro+Med Plantbase – The information resource for Euro-Mediterranean plant diversity

Project leader: Dr Eckhard von Raab-Straube

Duration: since 2000

Supported by: the EU (2 projects), BMBF, topped up with own resources

Cooperation with: among others, the Finnish Museum of Natural History, Helsinki; Institute of Botany, Slovak Academy of Sciences, Bratislava; Orto Botanico e Herbarium Mediterraneo, Università di Palermo; PESI – a Pan-European Species directories Infrastructure

The Euro+Med PlantBase is an online database on the flora of Europe and the Mediterranean region, the Atlantic islands and the countries of the Caucasus. Its aim is to create a complete inventory of the species diversity of vascular plants in the region, and to make this available online. The internet portal provides free access to information on the more than 40,000 species and subspecies in the region. The data is constantly updated, critically assessed and added to by an international network of taxonomic and regional experts. Using the correct nomenclature, and following the current understanding of plant families, a consistent taxonomic database is thus being produced for the whole continent.

The BGBM has been developing this database since 2000 as part of several transnational projects. It has now been transferred to a new database system, the EDIT Platform for Cybertaxonomy. This provides a broader conceptual and technical basis, which can effectively link new research outcomes on family relationships, species boundaries and changing classifications with the relevant scientific plant names. The same applies to new findings and changes in the distribution of species, since the internet portal also shows maps on species distribution in specific countries or regions. As well as this, plant names are given in many languages, information provided on status in the area (for example, whether the species is native or introduced), and much more. All the data are backed up by sources and literature citations, so can always be verified.

The Euro+Med PlantBase coordination unit, based at the BGBM, enables us to ensure long-term storage of the data. This gives us an overview of current research and literature, and also allows us to maintain contact to and within the scientific community. At the end of 2014, 187 plant families had been published, i.e. 92% of the plant species of the European and Mediterranean region. It is expected that all species will be covered by the end of 2016. The Euro+Med PlantBase is therefore becoming, for scientists from various disciplines as well as for laypeople, the standard reference site for the flora of Europe and the Mediterranean region. It is also an example of an institutionally backed long-term programme demonstrating the need for internationally recognised research, and so contributes to the overarching coordination of research activities.



Protecting biodiversity requires not only scientific knowledge, but also a general commitment from the whole of society. Guided tours, such as the visits to the BGBM greenhouses open to the public, help raise awareness among a wider audience.

Basic research and the publishing of project results and information are often closely linked to practical tasks related to maintaining biodiversity. In Germany, the ‘Red lists of threatened animals, plants and fungi’ are a yardstick for measuring biodiversity and are thus important tools for nature conservation and land-use planning. Red lists are therefore published regularly by the Federal Agency for Nature Conservation, to assess and communicate the current level of threat weighing on individual species in Germany.

As part of a research and development project supported by the Federal Agency for Nature Conservation, a BGBM project team developed strategies to make the production and updating of the red lists more efficient. One priority was to improve the cooperation of the federal and federal state authorities with scientists and volunteers, as the various tasks carried out by these groups form the foundation for the red lists. In addition, data on the inventory of species found in Germany has been reorganised, since in the long term these so-called ‘species diversity checklists’ are to be administered and updated via the EDIT platform in a joint database system. The project, therefore, not only clarified organisational issues, but also developed IT tools for this sort of joint taxonomic reference list. There are many synergies here with the Euro+Med PlantBase, and a clear role is emerging for natural history collections as intermediaries between taxonomic research and its use in nature conservation.

Red Lists 2020

New yardstick for biodiversity in Germany

Sample project:	Red Lists 2020 – preparatory phase
Project leader:	Prof. Dr Walter Berendsohn
Duration:	2011 – 2015
Supported by:	Federal Agency for Nature Conservation
Cooperation with:	nature conservation authorities in all federal states, and nature-related voluntary associations



The Caucasus region, with the Greater and Lesser Caucasus mountains, is, in many respects, a link between Europe and Asia. However, the isolated mountain ranges running between the Black and Caspian Seas have also resulted in many peculiarities – a diversity of culture and language, and also of nature. The Caucasus region is, apart from the tropics, the region in the northern hemisphere with most species, with its own unique flora and vegetation. In 2009, together with partners from the region, we set up a ‘Caucasus Biodiversity Initiative’. The long-term aims of this project are to improve our understanding of the evolution of plant variety in the Caucasus and the main factors influencing it, thus supporting nature conservation, land-use planning and the sustainable use of genetic resources in the Caucasus.

In its first phase, from 2011 to 2014, our project ‘Developing Tools for Conserving the Plant Diversity of the Transcaucasus’, also involving several partner institutions from Armenia, Azerbaijan and Georgia, focused largely on scientific capacity building in our partner countries. Activities included the training of doctoral students, exchanges of students, scientists and technical staff, as well as help with establishing modern laboratory facilities, database structures and improving the management of collections in the herbaria of the countries of the South Caucasus. Various genera of flowering plants (such as *Campanula*, *Dianthus*, *Jurinea*, *Papaver* and *Pyrus*) and lichens (*Ramalina*) were selected as model-groups, the phylogeny and biogeography of which would be analysed. One aim is to carry out taxonomic work, based on an approach including both molecular and conventional morphological methods, as well as representative sampling of the whole Caucasus ecoregion. Detailed population genetic analyses were carried out on certain species to reveal spatial distribution patterns of genotypes, identify possible refugia, assess gene flow and ultimately develop, from this, strategies for managing plants and ecosystems. As well as cooperating with the South Caucasian countries of Armenia, Azerbaijan and Georgia, in the next few years our joint work will be extended to partners in Russia, for the North Caucasus, as well as in Iran and Turkey.

Above: The Caucasus is a centre of species diversity. Many species of wild pear trees (*Pyrus*), in particular, can also be found here. Most of these grow in dry, almost steppe-like open woodland. In this picture, for example, *Pyrus medvedevii* is growing in the Noravank Gorge, Armenia.

Below: The Hyrcanian forests in southern Azerbaijan (in the picture, mixed woodland at Xanbulan in the Talish mountains) and the Colchic forests of western Georgia are particularly important for biodiversity. They are so-called relict forests, hosting many plant species that have survived the climatic changes of Earth’s recent history.

The Caucasus

A biodiversity hotspot between East and West

Sample project:	Developing tools for conserving the plant diversity of the Transcaucasus
Project leader:	Prof. Dr Thomas Borsch
Coordinator:	Dr Nadja Korotkova
Duration:	2011 – 2014
Cooperation with:	partner institutions from Armenia, Azerbaijan and Georgia
Supported by:	VolkswagenStiftung



Palmas / große Früchte
Geveia s. - *Saxau* P. 1



Palmas / große Früchte
Geveia - *Saxau* P. 1



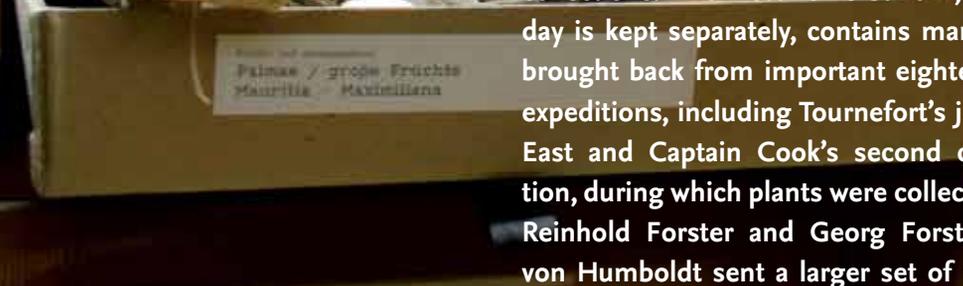
Palmas / große Früchte
Ludota



Palmas / große Früchte
Mauritia - *Maximiliana*

Collections with history

The herbarium of the Berlin botanist Carl Ludwig Willdenow, acquired in 1818, forms the basis of our collections. This historic herbarium, which to this day is kept separately, contains many specimens brought back from important eighteenth-century expeditions, including Tournefort's journey to the East and Captain Cook's second circumnavigation, during which plants were collected by Johann Reinhold Forster and Georg Forster. Alexander von Humboldt sent a larger set of the plants he collected with Aimé Bonpland on the Orinoco to Berlin since it was his friend Willdenow who would later take on the role of processing them. Among its more than 20,000 species, Willdenow's herbarium includes many type specimens of newly described species, making it an important part of our institution's green treasury.



Palmas / große Früchte
Geveia s. - *Saxau* P. 1

E

Biological Collections

The collecting of plant specimens is a cornerstone of botanical science, concerned as it is with recording and describing plant diversity. The goal is to document the biodiversity of a habitat at a specific point in time or the variability of different individuals within a species. It is in this way that, over more than three centuries of botanical research, the exceptional collections of the BGBM have been amassed: the herbarium with 3.7 million specimens of dried plants and other botanical objects (such as fruits, wood samples and artifacts); the seed bank with germinable, frozen samples; the DNA bank; and, last but not least, the collection of living plants.

Today, these collections are not just a scientific archive. Modern data networking methods and the presentation of entire collections online mean that the BGBM's biological collections are increasingly used by researchers from all over the world. Collections such as those of the BGBM in particular, which cover a large geographical range and a long evaluation period, are relevant to current research questions. Our research trips and collaborative projects contribute to the steady expansion and improvement of the plant collections.

The collecting concept is principally geared towards the collecting of plant groups that correspond to our research priorities. While the herbarium, with its building infrastructure, is able to hold twice the number of specimens, capacity is considerably more limited in the living plants collection. Here, therefore, we sometimes have to remove plants that are not necessary for our research and give them to other botanic gardens. This enables us to continuously develop the plant material in line with the collecting concept, without literally being overwhelmed by it. Accompanying every plant specimen in the herbarium, every seed or living plant is information about their name and origin, often together with official documents such as collecting permits or export licences.

These are archived in central databases and are available to all those working on the material. Data management and information flows are therefore organised in cross-departmental teams. Indeed, the long-term scientific value of a collection is determined by the accurate and verifiable documentation of all information. Such databases also provide the basis for the online presentation of the collections. At present, for example, 153,034 herbarium specimens are accessible on the internet as digital images.



A living collection

It is the collection of living plants that makes the Botanic Garden a living museum and a perfect place to experience nature. In the outdoor areas and greenhouses, we cultivate a variety of native and exotic wild plants. Each of these is recorded in our databases with information about its provenance – there are around 35,000 accessions in total.



The extensive parkland includes many different themed gardens, such as the medicinal plants garden, the arboretum or the marsh- and aquatic plants garden. A special feature is the so-called phytogeographical (or Plant Geography) section. The World in a Garden is more than a mere catchphrase here. This is where we showcase the principal types of vegetation of the northern hemisphere in true-to-nature settings and where visitors can experience live one of the focal points of our scientific activities: at the heart of Plant Geography are the plants of the eastern Mediterranean, especially Greece, and the Caucasus.



As part of our collaborative research projects, our scientists and gardeners have undertaken several trips to Georgia, Armenia and Azerbaijan in recent years. This has allowed seeds and seedlings from this region to be collected and the Botanic Garden's Caucasus area to be remodelled and enriched with valuable plant material from its natural habitat. Altogether, around 1000 wild provenances and 300 nursery provenances have been brought to Berlin from the region. The transformation of the Caucasus area was carried out first and foremost according to scientific criteria, and a high level of creative and horticultural skills were required in order to present the extraordinary botanical diversity of this region within a limited space. The Botanic Garden's 'Mini-Caucasus' was reopened in May 2014 and formed part of the Caucasus exhibition held that year at the Botanical Museum. The expansion of this part of the garden is ongoing, however: more new plants and new beds are going to be added in the coming years.



But a lot has also been done in recent years behind the scenes, i.e. in the outdoor section that is not open to the public. This is where we cultivate, among other things, rare and endangered native plant species. Following rigorous scientific criteria and in collaboration with the nature conservation authorities, seeds or plant parts are taken from the wild and propagated in the garden in a controlled way. This enables us to provide seeds or seedlings for species conservation and restoration measures.

One of these special plants is *Carex depauperata*, a grass-like plant that grows in the understory of light, warm deciduous forests. Its common name, starved wood-sedge, is actually a reference to its relatively few flowers, but today also symbolises the threatened status of this species.

As a result of intensive forestry, populations across Europe are in sharp decline. In Germany, the starved wood-sedge is now only known from one site in the far west, near the Luxembourg border. For a long time, it was even considered to be extinct. In 2011, a single plant was rediscovered and, in 2013, we succeeded in making it bloom and fruit for the first time. It will hopefully soon be possible to use the stocks from the Botanic Garden to boost the population in its natural habitat.



The exotic flora of the tropics and subtropics can be enjoyed throughout the year in the Botanic Garden's greenhouses. The Main Tropical Greenhouse (Großes Tropenhaus), which was reopened in September 2009 following a total overhaul also designed to make it more energy-efficient, presents tropical forests from different continents. Special glasshouses are dedicated to particular groups of plants such as bromeliads, orchids and desert plants, which visitors can explore on a tour. Particularly valuable parts of the living collection of tropical and subtropical plants, difficult-to-cultivate species and also seedlings are cultivated in separate greenhouses that are not open to the public. Here, too, it is important to improve the collections in accordance with scientific criteria. Old plant stocks, whose origins are mostly unknown, are thus gradually replaced by new, well-documented material.

We are constantly striving to present our living collection in ever more impressive ways. Thus the orchid house was radically remodelled in 2013. Orchids from tropical America in particular are now to be seen here with suitable companion plants. In redesigning, we used trunks of locust-tree as the substrates closest to nature. A highlight in the early spring is the flowering of camellias and azaleas. With our collection of mainly historical azalea varieties we have, since March 2012, been a partner of the German Rhododendron Gene Bank, a network supported by the Federal Ministry for Food and Agriculture to protect valuable propagating material.



The most important new addition to the greenhouse collections in recent years has been Professor Wilhelm Barthlott's collection of epiphytic, i.e. tree-dwelling, cacti, considered to be the most complete in the world. It was transferred to Berlin in March 2012 after Prof. Barthlott's retirement from the Botanic Garden in Bonn. This collection is particularly valuable to us because cacti belong to the *Caryophyllales* order, which is one of our research interests. The necessary plant material is therefore now available for a current research project on the phylogenetic history of the spectacular 'Queen of the Night'.



We have also further expanded the focus collection of plants from Cuba and the Caribbean: together with scientists from the region, we undertook three field trips to various parts of Cuba between 2012 and 2014. This allowed us to bring extensive plant material, especially seeds and cuttings, back to Berlin, thus enriching the collection by 400 accessions.



Herbarium

What if the BGBM's herbarium had to handle and store a donation of some 2 million additional specimens? As a matter of fact, it wouldn't be a problem. The herbarium is one of the oldest parts of the BGBM, but is equipped to the very latest standards. These include the optimisation of work processes, which allow for the continual growth of the extensive collection. Many specimens are still currently stored in the museum's attic, but this backlog is gradually being reduced and, in the past year, it has already been possible to process, mount and file about 80,000 specimens. The technical infrastructure in particular has been steadily developed in recent years, including for example the installation of a new cold room. The building is therefore designed for a total of 7 million specimens. About 3.7 million are already preserved here, which means that there is still considerable capacity to document plant diversity. Even as it currently stands, however, the Berlin herbarium is Germany's foremost herbarium for specialists the field.

Herbarium specimen of a plant collected in Cuba in 2011. Comparative studies showed this to be a new species. Using this specimen as a type, the species was first described by Idelfonso Castañeda under the name *Coccoloba berazainiae*.





Seed bank

The Dahlem Seed Bank is an important piece in the overall jigsaw of the BGBM. A repository for seeds from wild plants, it is closely linked with the other parts of the collection, namely the living collection in the greenhouses and in the open air, the herbarium and the DNA bank.

The seed bank fulfils a whole range of functions. On the one hand it stores seeds from endangered and rare plant species, which are available for reintroduction when necessary – thus making a direct contribution to species conservation. On the other hand it preserves seeds that are collected in the wild as part of research projects, and are then available long term for scientific investigations. In addition, seed material that is harvested in the Botanic Garden is processed and stored here. In all cases, exact documentation is required, and this takes place in conjunction with the other parts of the collections.



Sample project: **WEL – gene bank for crop wild relatives**

Project leader: **Prof. Dr Thomas Borsch**

Duration: **2009 – 2014**

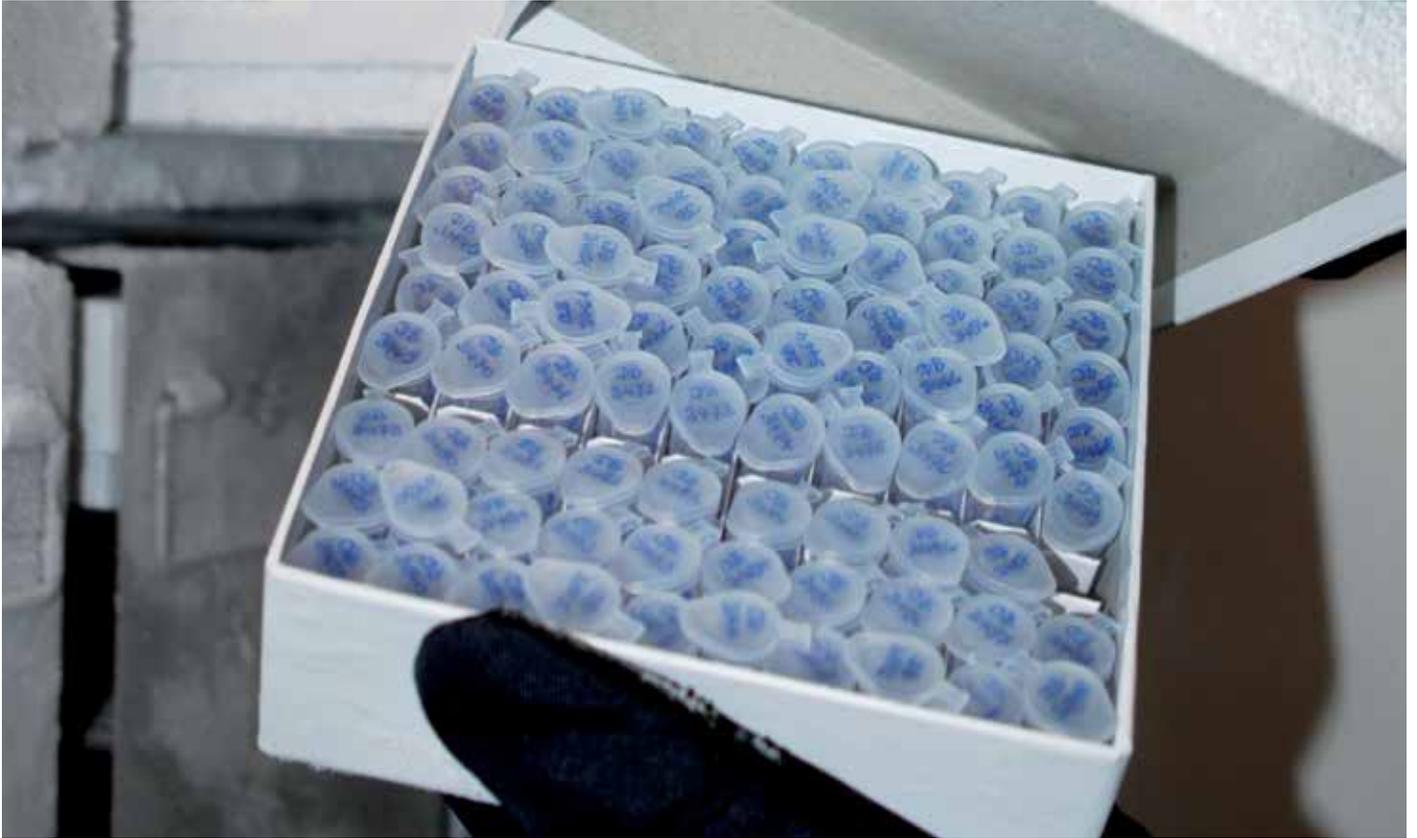
Supported by: **Federal Office for Agriculture and Food**

Sample project: **WIPs-De – network for the protection of endangered wild plants under Germany's special responsibility**

Project leader: **Prof. Dr Albert-Dieter Stevens**

Duration: **2013 – 2018**

Supported by: **Federal Agency for Nature Conservation**



The Global Genome Biodiversity Network (GGBN, www.ggbn.org) is a service facility for the study of biodiversity. Its aim is to make DNA and tissue samples available to scientists around the world via a common platform. The GGBN seeks to develop global standards for handling DNA and tissue samples and their data, and works closely for example with the European Union and CETAF (Consortium of European Taxonomic Facilities) to support the implementation of the Nagoya Protocol among the partners. The network was founded in 2011 and now includes 31 partners worldwide. Its predecessor, the DNA Bank Network, was cofounded by the BGBM in 2007.

The BGBM has coordinated and hosted the virtual infrastructure of the GGBN / DNA Bank Network since 2007 and has set itself the task of permanently fulfilling that role. The Smithsonian Institution's National Museum of Natural History is responsible for the GGBN's overall coordination.

DNA bank

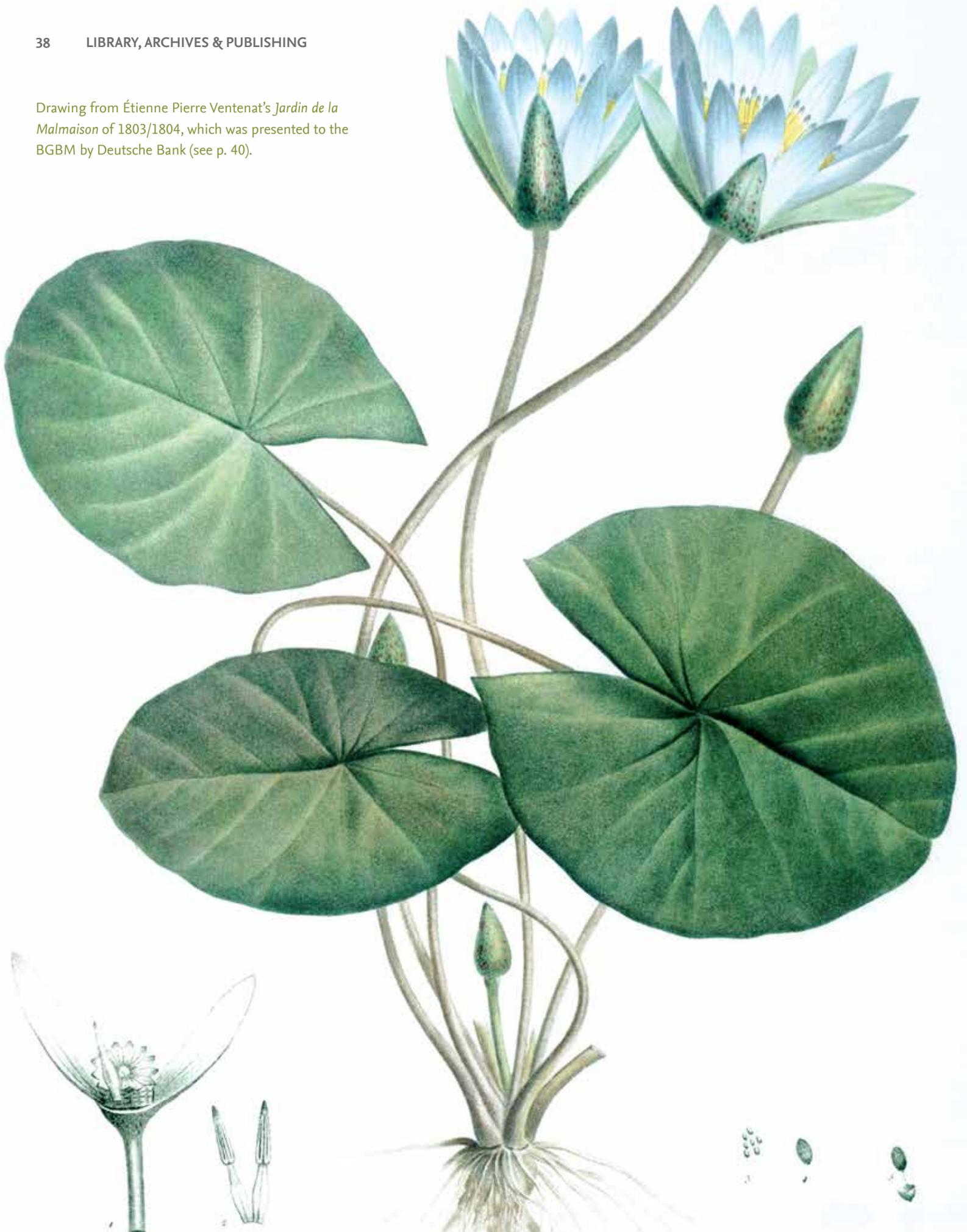
Sample project: Expanding the “DNA Bank Network” into the “Global Genome Biodiversity Network”

Project leaders: Anton Güntsch & Gabi Dröge

Duration: 2014–2015

Supported by: DFG

Drawing from Étienne Pierre Ventenat's *Jardin de la Malmaison* of 1803/1804, which was presented to the BGBM by Deutsche Bank (see p. 40).



F

Library, Archives & Publishing

Three different sections rolled into one, the BGBM's Library, Archives & Publishing department is concerned with the processing and presentation of information. At the interface between science and the general public, it keeps publications on hand, makes archival material available and actively engages with scientific life through its own publications. Each section responds to different requirements and target groups.

The library is the right place to get accurate information about drugs or poisonous mushrooms. Since 1819, the BGBM's library has seen its role as being to gather in one place scholarly botanical literature published around the world. It now holds more than 200,000 volumes, including not only the 'blossoms' of the subject, but also identification literature, botanical publications for specialists, as well as material on botanic gardens.

Portraits and manuscripts, on the other hand, are to be found among the BGBM's extensive archives. Two types of archival material are preserved here and are available for research purposes. First, so-called 'flatware', such as correspondence, plant drawings, botanical wall charts, historical employee records or bequests from scientists formerly employed at the BGBM. And second, three-dimensional material, one example being the collection of microscopes documenting the evolution of these instruments over the last 150 years.

The BGBM's library is the natural complement to the biological collections and the largest of its kind in Germany. Users can find out about what they have seen, read the latest publications or simply learn something about botany in general. For those studying in Berlin and beyond, the library at the Botanic Garden is the most extensive research centre there is. Digitisation projects play an increasingly important role in this. German botanical journals from the period 1753–1914, for example, have been made digitally accessible by the BGBM, in partnership with the Johann

Christian Senckenberg University Library in Frankfurt. This nationwide project was supported by 25 other German libraries, which used their own stocks to complete the DFG-funded digital historical collection.

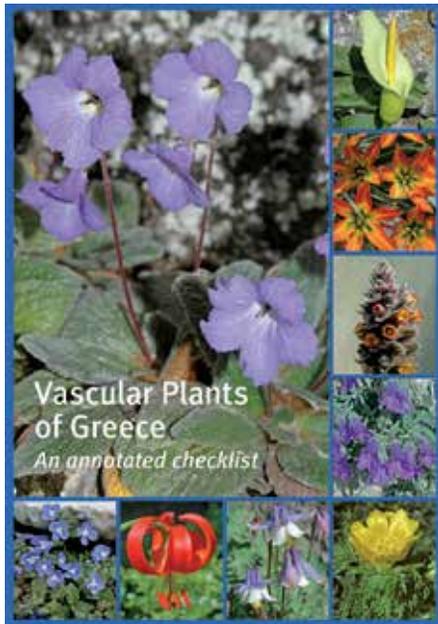




Karin Oehme, chief librarian at the library of the BGBM, is delighted with the valuable new accession, *Jardin de la Malmaison*.

Sometimes archives and library coincide in a unique way: since May 2012 the BGBM has been the proud owner of a book that once passed through the hands of the French emperor Napoleon himself. The work, *Jardin de la Malmaison*, by Étienne Pierre Ventenat, is a portrait of the garden of Josephine, the first wife of Napoleon and later Empress of France. The garden of the chateau of Malmaison was redesigned for her around 1800 by renowned landscape gardeners, and the botanical painter Pierre-Joseph Redouté depicted the garden's botanical rarities in around 120 plates, which are still to this day among the masterpieces of botanical illustration. Only about 100–200 copies were produced at the time, each of them a wholly original creation.

A stamp in the BGBM's copy proves that it was a personal gift from Napoleon to his father-in-law, the Austrian emperor Francis I, and was kept in the latter's private library. After various peregrinations the book found its way onto the market. Thanks to its acquisition by the Deutsche Bank, the book was secured for the scientific community, and was kept as a permanent loan in the library of the Botanical Museum. In 2012, after decades as a loan, it was transferred into the ownership of the BGBM for the symbolic price of one euro.



While the library and archives are assigned a rather more passive role in the safekeeping and provision of knowledge, publishing at the BGBM is an active instrument for the dissemination of knowledge and the communication of research results to a wider audience. Two periodicals have been published at the BGBM for several decades: the botanical journal *Willdenowia* and the monographic series *Englera*. Both are internationally renowned journals. *Willdenowia* has been indexed since 2012 in the Journal Citation Reports brought out by Thomson Reuters.

In addition to periodicals, BGBM Press also publishes foundational works such as, in 2013, the checklist of Greek vascular plants. With the information gathered together here, scientists can for the first time gain a comprehensive picture of the flora of Greece and, as a result, establish measures for species conservation projects. This checklist of vascular plants was produced in cooperation with the Hellenic Botanical Society, with which the BGBM has collaborated closely for decades.

Volume 31 of BGBM's monographic series *Englera*: Dimopoulos P., Raus Th., Bergmeier E., Constantinidis Th., Iatrou G., Kokkini S., Strid A. & Tzanoudakis D. 2013: *Vascular plants of Greece: An annotated checklist*. – Berlin: Botanic Garden and Botanical Museum Berlin; Athens: Hellenic Botanical Society.

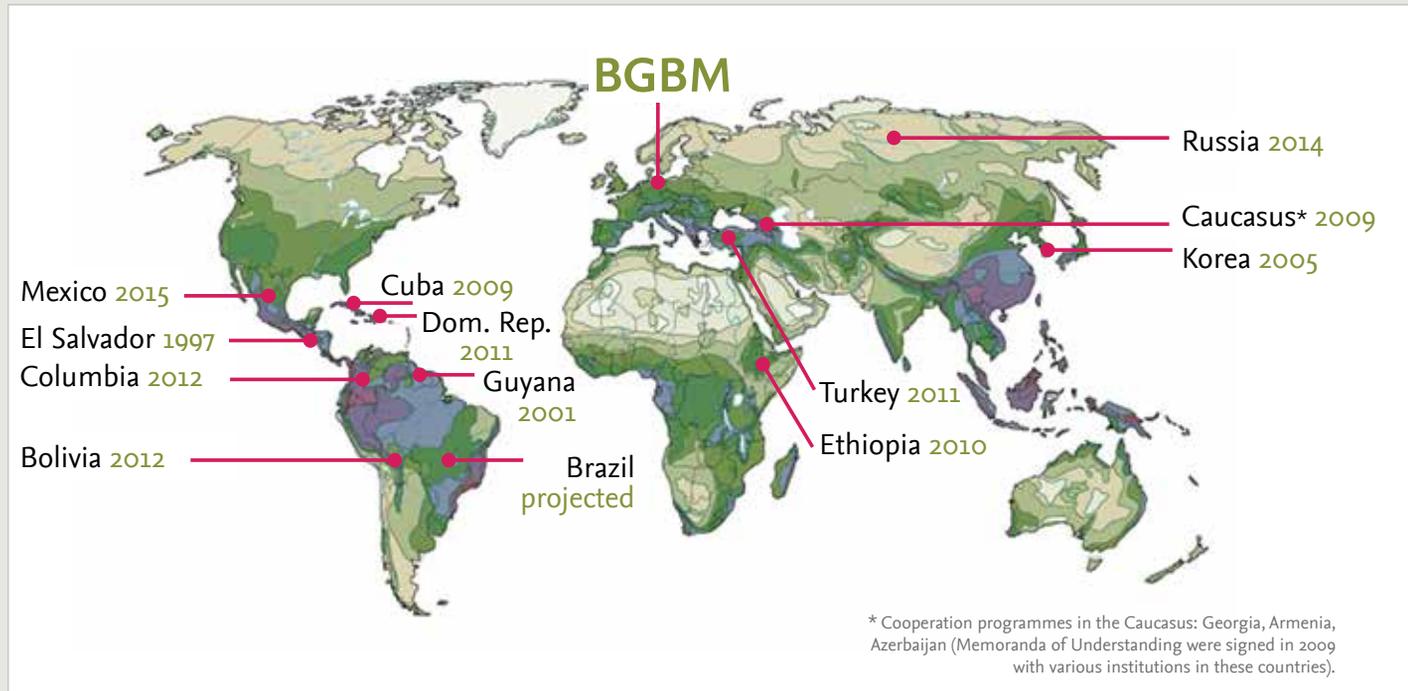


Tales from the archives

Some interesting anecdotes are associated with the archives. August Wilhelm Eichler was director of the Botanic Garden from 1879 to 1887. This was an eventful time, with world's fairs, the invention of electricity, and rapid industrialisation. There is no question that the director of a botanic garden would have been preoccupied by such innovations, but a recent find has provided us with absolute proof that this was so. In the attic of a residential building that almost certainly once belonged to the Eichler family, a box of handwritten papers, galley proofs, herbarium material and correspondence was found. Following the purchase of this material from the finder, the archives of the Botanic Garden have been enriched with this historically interesting testimony of a researcher in the last decade of his life. The legacy is currently being catalogued by Peter Hirsch.



The BGBM is part of an international cooperation network, based on concrete agreements, with partners from biodiversity-rich regions. We have concluded long-term agreements with our main partner institutions.



In addition, the BGBM is in touch with institutions in many countries around the world through individual cooperative research projects and intensive exchange and lending in the following areas: library (exchange of publications), herbarium (duplicate exchange and borrowing) and living collection (Index Seminum):

Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Guatemala, Hungary, Iceland, India, Indonesia, Iran, Ireland, Italy, Japan, Jordan, Kazakhstan, Kenya, Latvia, Libya, Lithuania, Luxembourg, Macedonia, Malaysia, Morocco, Namibia, Netherlands, New Zealand, Nicaragua, North Korea, Norway, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Romania, Russia, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Syria, Taiwan, Thailand, Turkey, Ukraine, United Arab Emirates, United Kingdom, Uruguay, USA, Uzbekistan, Venezuela, Yemen

G

International Network

Recording and describing the variety of plant life on our planet is a highly topical activity. Due to its scientific expertise, the BGBM plays an important role in the worldwide network of research and collecting institutions. Our cooperation programmes with local partners often date back several decades, and biodiversity and its conservation are always at the heart of our work. Official agreements with institutions in our partner countries put this cooperation on a formal footing and facilitate scientific exchange. Thus the BGBM has cooperation agreements with 17 institutions in 11 countries. Three of these have been renewed in recent years:

- The BGBM has had close relations with the University of Addis Ababa (Ethiopia) since 2008. In 2014, the existing Memorandum of Understanding (MoU) was considerably extended by an addendum, which sets out research topics of importance to both universities. As well as our work with the Gullele Botanic Garden, the agreement formalised our longer-standing cooperation with the Ethiopian National Herbarium, which is also part of Addis Ababa University.
- In 2009, the BGBM established the Caucasus Biodiversity Initiative. Since then, close relations have developed on the basis of this initiative with the South Caucasian countries of Armenia, Georgia and Azerbaijan. More than 30 scientists are now involved, through joint research projects. Since 2014, we have also had agreements with institutions in the Russian Federation, to which the North Caucasus belongs. This year, MoUs have been signed with the Komarov Institute in St Petersburg and with Kuban State University in Krasnodar.
- The Jose Celestino Mutis Botanic Garden in Bogotá, the capital of Colombia, is a new cooperation partner for the BGBM. Cooperation began in 2012, with support from the Federal Ministry of Education and Research, and from the Colombian ambassador, H. E. Juan Mayr Maldonado. Since 2013, the Federal Ministry of Education and Research's International Bureau has supported a pilot project aimed at linking biodiversity conservation to the sustainable management of a water catchment area in the Bogotá region. As part of this project, a network of institutions has been created and a preliminary study produced for a larger project. The Institute of Geographical Studies and Institute for Latin American Studies of the Freie Universität Berlin are also involved.
- In early 2012, a cooperation agreement was concluded with the Herbario Nacional de Bolivia, which is being developed in the capital, La Paz, by the Universidad Mayor de San Andres's Instituto de Ecología and the Museo de la Historia Natural. This agreement is based on the successful friendly cooperation established by Prof. Thomas Borsch with Dr Stephan Beck, director for many years of the Herbario Nacional de Bolivia, and with his successor Rosa Isela Meneses. The agreement will enable progress to be made on recording and monographs on the plant diversity of Bolivia, since Bolivia is one of the few Latin American countries without a modern Flora. To decide on the next steps to be taken, a joint workshop was held in early 2013 in La Paz, attended by representatives from all the regional herbaria in the country.



- In 2012, an older, 1997, cooperation agreement with the Botanic Garden in La Laguna, El Salvador, was extended, crowning an already long period of successful cooperation: Walter Berendsohn, together with German and Salvadoran colleagues, has been researching and describing the flora of El Salvador for around 25 years. The second volume on the trees of El Salvador, richly illustrated and complete with identification keys (*Nova Silva Cuscatlanica, Parte 2: Angiospermae – Familias M a P y Pteridophyta*, with 289 species), was published in 2012.

Working together in different ways

Quite separately from these formal arrangements, we also work, in our research and development projects, with many other scientists from across the world. One product of this cooperation is the monograph on the lichen family *Cladoniaceae*, in the series *Flora of the Guianas*, published in 2013 by the Berlin lichen specialist Dr Harrie Sipman together with his Finnish colleague Teuvo Ahti.

The BGBM is a partner in international scientific networks, and, as such, is not only actively involved in cooperation projects in many countries. The most important of these networks is perhaps that related to the World Flora Online project, which has undertaken the ambitious task of developing a worldwide Flora, i.e. a plant inventory covering the whole globe.

The BGBM also plays host to many scientists from across the world who wish to use its scientific collections for their research, or simply to hold discussions with colleagues. Workshops or meetings are a perfect opportunity for exchanging ideas. In the last two years, for example, the BGBM has organised two events for the ‘Global Biodiversity Information Facility’ (GBIF). This somewhat unwieldy name refers to an international initiative that aims to make scientific data and information on global biodiversity permanently available on the internet, at no charge. The data concerned includes, for example, information on stocks held by herbaria and natural history museums, as well as research and observation data, which can then be used by scientists and other interested parties.

In September 2013, the annual general meeting of the GBIF governing board took place in Berlin, attended by 150 scientists and government representatives from 38 countries, setting the course for the future development of the initiative. The events were organised jointly with the Berlin Natural History Museum, a complementary institution with which the BGBM frequently works closely on many initiatives. Another example is the collaborative project ‘GBIF Deutschland’ (www.gbif.de), which was coordinated by the BGBM, and which pooled data from German natural history museums, herbaria and research databases.

In this way, by the end of 2013 around 13 million data records had been collected from across Germany, all of which can be consulted at www.gbif.org.

The visit by the BGBM's head of exhibitions, Kathrin Grotz, to Santo Domingo was the first time that cooperation had been organised not so much in the field of research, but rather in relation to the communication of knowledge. It turned out to have been a worthwhile experience.



Head of exhibitions, Kathrin Grotz, together with local project partners in the Dominican Republic.

In April 2013 she travelled to the Dominican Republic, to work with local partners on a planned exhibition. The first idea was to set up, in Santo Domingo Botanic Garden, a discovery trail on biodiversity, endemism and crop plants in the Republic. This project involved Kathrin Grotz and Dr Susy Fuentes from the Berlin side, Ricardo García, director of the Santo Domingo Botanic Garden, Dr Francisco Jiménez, curator of the Santo Domingo herbarium, Brígido Peguero, a botanist at the Santo Domingo herbarium and Karsten Windeler, a sponsor based in Santo Domingo who is supporting the 'Camino Taino' project. The outcome of these meetings was a jointly developed exhibition plan, as well as a discovery trail.



H

Museum, Exhibitions & Education

There are not many botanical museums – perhaps only a handful worldwide. Many natural history museums house botanical collections and exhibition areas, but have little capacity for the exploration, never mind the in-depth elaboration, of botanical topics. Berlin's Botanical Museum, with its direct connection to the Botanic Garden, is all the more remarkable then. Here, the exhibition space in the open air is extended by the exhibition space inside the museum. New research results, as well as historical facts and key themes covered in the outdoor exhibition areas, can be shared with a broad public.

Furthermore, the Botanical Museum is in itself the subject of research due to its long history and the story of its foundation. The Royal Botanical Museum's original building dates back to 1880, at that time still at the garden's old location in Schöneberg, which was already 200 years old. The building currently used as a museum was put into operation in 1907. Then, as now, the idea of education, research, and even training was at the fore – indeed the then director, Adolf Engler, stated in 1909: 'It is intended to provide the student and every seeker of knowledge ... with an overview of the most important phenomena of plant life, plant history, plant distribution and the use of plants.'

However, access for visitors without their own research interest is a modern achievement: the senior botanists then in charge thought that the garden should function solely as an educational establishment and on no account as a place of recreation. In 1910, the Botanic Garden and Botanical Museum Berlin-Dahlem was officially opened by Adolf Engler. Since then, the museum has been an integral part of the exhibition and research centre that is the BGBM. It was included within the original plans for the garden and understood as part of the overall concept: as an enrichment of, and extension to, the living collection in the garden.

Even in its early years, the museum's exhibits were the result of effective networks, the museum being enriched both through exchange with other institutions and by the acquisition of objects or suggestions from colleagues. The result is a museum that is one of a kind.



Showing the small in enlarged form is a special feature of the Botanical Museum, which is well known for its models. What is less well known is that the Botanical Museum also incorporates the living collection in the garden into its exhibitions, thus keeping alive to this day Engler's idea of an overarching exhibition concept involving both garden and museum. Sometimes, part of the special exhibition is displayed in the garden, as is the case with the Caucasus exhibition (photo: next page, above) – a concept that will increasingly become a reality in the future.



With the exhibitions, the open air always plays a role as an exhibition space. As for example in the Caucasus exhibition, or in the case of...

Every year, a large exhibition is devoted to current topics, often with reference to the Botanic Garden as a research institution. These special exhibitions feature regions such as the Caucasus, which are not that well known to a wide audience, but also more popular topics such as coffee.



...gallery exhibitions such as 'Crochet en Plein Air',
crochet art by Katharina Krenkel.

As well as presenting changing special exhibitions, the museum also has a large permanent display. The building housing the museum was designed specially for this purpose. The same is true of the fittings, which are also a Berlin speciality. The museum has around 600 botanical models. Each individual model was elaborately crafted using a specially developed method, being done for decades by hand (between 1958 and 2002). The models, which show plants in enlarged form, make details visible that are otherwise barely visible to the layperson. The permanent display also includes dioramas. Dioramas are miniature replicas of entire landscapes shown against a coloured landscape background. The resulting 3D effect was extremely popular in the early 20th century and even today has lost none of its charm. Since the start of 2012, the museum's models of plants, plant parts and whole landscapes (dioramas) have been searchable via the online database at www.universitaetssammlungen.de. This database is primarily of interest to historians of science, scientists and curators of scientific collections.

The museum's many exhibitions allow us a glimpse of the modern age. The driving force and mastermind behind these exhibitions is (alongside a few others) the section head Kathrin Grotz.



INTERVIEW

What's the biggest challenge for you in putting together a temporary exhibition?

We put on a new exhibition practically every year, most of the work being done in house. Over the years we have covered a great many topics: from Japanese garden plants to the giant water lily, from coffee to the Caucasus – the range is enormous. For each new project I read up on the subject so as to create, together with specialists in the field, the exhibition concept. Working on very different subject matter always presents a new challenge for me, but it's also a lot of fun. The implementation of the concept is obviously then the largest chunk of work for me and my team. In the run-up to each new opening, things can get pretty hectic at times, but so far [laughs] we have always managed to have everything ready in time.

In recent years, repeated emphasis has been placed on the notion that museum and garden are intimately bound up with one another. What does this mean exactly?

It's obvious that our exhibitions are not merely 'museum-like' in nature. Museum and garden are united not only at the organisational level but also spatially and thematically, and we make quite deliberate use of this peculiarity: in the museum we exhibit what cannot be shown in the garden, either for conservation or other reasons, the garden then providing our visitors with an opportunity to encounter the 'living' objects. Our 'Caucasus patch' in the garden is thus an integral part of our current Caucasus exhibition.

Are you able to give us any anecdotes?

When we revamped our permanent display a few years ago, my col-

league and I wanted to document the original colours of the display cases that we were renovating. So as to be able to get as close as possible to the unadulterated colours, the architect suggested that we do the colour-matching at night and with the aid of a special lamp. So we went to the museum at midnight and, by the light of our special lamp and armed only with an NCS colour fan, we settled on dozens of colours in the pitch-dark rooms. That took for ever, because we couldn't immediately agree on any of them...

How do you hope the museum will develop?

I very much hope that the museum becomes ever better known and that we can continue to increase our visitor numbers. Currently, a lot of visitors simply walk past the museum entrance on the way to the garden. The planned redesign of our entrance hall, which will incorporate a visitor centre, will hopefully bring about a better integration of the exhibition areas into overall visit.

What's so special about the Botanical Museum Berlin?

The museum is small but select, and in terms of its coverage unique in Germany. And it has a unique collection: models that have been made especially for us in the last 50 years by model-makers demonstrating painstaking attention to detail. In the coming year we are going to be putting this collection centre stage in a special exhibition entitled *Model/SHOW*. But the collection of botanical finds from Egyptian tombs is also unique and has earned us a reputation as Berlin's second Egyptian museum. And of course there is a lot more besides, not the least of which are the numerous ethnobotanical objects.



Events & Visitors

Summer in the Botanic Garden is reserved for the highlights of our events programme. For several years we have held our summer evening concerts, when the very best music groups bathe the garden in music. The range of music on offer is almost as extensive as the variety of plants in the garden. We take a musical journey around the world, from classical instrumental music to rock'n'roll. Following the concerts, visitors are offered free guided tours: an offer that is very gladly taken up.

Another musical event, and a particularly colourful one at that, is the Tropical Nights. Every four weeks, audiences are treated to live bands, cocktails, and evening tours of the garden. In addition to its home-grown events, the BGBM is also an exciting place for external promoters. Kicking off the season is the twice-yearly perennials market, which is one of our best-attended events. A range of children's activities make the market a worthwhile outing for the whole family. The Botanical Nights are yet another regular fixture in the calendar. Individual events such as Halloween or 'reading nights' round the whole thing off. As far as events organisation is concerned, the Botanic Garden is only just starting out, and has so far exploited only a small part of its potential. The involvement of professional tourism experts and the intensification of activities along these lines will be sure to generate a number of other events in the future. It is possible to envisage film series, as well as sponsors' events, an 'allotment gardeners' day', theatre evenings, artists in residence and collaborations with innovative places such as the Prinzessinnengärten in Kreuzberg. **The World in a Garden** was Engler's motto: true to this motto, our job is to bring this world to the people.

"Flowers don't have to be beautiful. They just are."

This quote by the lyricist Anke Maggauer-Kirsche puts it in a nutshell: the garden is wonderful in the summer. Everything is in bloom, and it really doesn't take much to entice visitors into the garden.



The twice-yearly perennials market is a firm fixture for all garden lovers and garden owners. The cactus fair attracts young and old, and the summer concerts offer musical enjoyment for everyone. The Botanical Night is also a great experience. The annual summer festival includes numerous performances, and the illuminations turn the garden and greenhouses into something really quite special.



Thanks to funding from the Berlin Monument Authority, the rose garden has been restored to its former glory.

A Listed Garden

Relatively few visitors know that the entire Botanic Garden is listed. It is easy to understand that buildings might be listed, perhaps even greenhouses. But nature? To paraphrase the very apt title of a symposium held here in 2009, botanic gardens are a reservoir of culture and nature, at the interface between nature conservation, science, and historic gardens preservation.

So as to be able to live up to this ideal, the Berlin Monument Authority, in close partnership with the BGBM, began operating a so-called ‘Garden Preservation and Management Plan’ in 2006. The plan’s completion in 2012 resulted in a recommendation that considers the garden’s importance as a cultural asset but also its key position in the history of science and garden design. Furthermore, the various expectations placed on a botanic garden are all met here: be that its usefulness as a place of science, the economic aspect, or the consideration of environmental factors. The aim is not only the maintenance of the garden and thus its preservation, but also its development in respect of conservation-related, horticultural, but also museological requirements.

The theoretical engagement with the notion of a listed garden finds expression here in the practical implementation of ideas. Thanks to funding from the Berlin Monument Authority, the BGBM’s rose garden, with its historic pergola encircling the pavilion, was completely revamped. In a project like this, the requirements of historic garden preservation are taken into particular consideration: in a botanic garden, a pavilion such as this is no solitaire, but is always part of its ‘natural, although artificially arranged’ environment.

Some renovations act to preserve and restore features to their original state, while others deliberately seek to adapt them to modern needs. After the Main Tropical Greenhouse, the Victoriahaus (Giant Waterlily House), which has been under restoration since 2006, is an example of sus-

tainable restoration geared towards massive energy savings. As already intended when the garden was originally established, *Victoria amazonica* will soon be on view again, in a glasshouse that satisfies modern requirements of sustainability and energy efficiency. The refurbishment of the Victoriahaus is more than just historic preservation in practice: it also represents the enhancement of a historic monument.



The brochure that was published in 2012 presented future heritage-related conservation projects due to be carried out in the Botanic Garden.



BGBM's Terra BoGa project was a guest at the 2014 Milan Expo.

The new compost turner facilitates the reuse of green waste.



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Sustainability

Terra BoGa – an unusual title, to say the least. Terra BoGa is an invented word, made up of the Portuguese term ‘terra preta’ (literally, ‘black earth’) and ‘Botanic Garden’. So how did it come about? Over the past three years, scientists from the Freie Universität’s Geocology working group have been involved in a project with the BGBM to use the organic waste from the garden to produce valuable black earth. The organic waste is analysed to determine its potential uses, and then prepared, following age-old recipes from the Incas in the Brazilian Amazon, to meet the needs of the garden. The garden has set itself the goal of recycling its own material, thus managing its own resources in a sustainable way. Huge amounts of organic waste are produced annually, which previously had to be disposed of conventionally, at considerable cost. Now, however, this waste produces valuable earth that is reused to benefit the garden. The project has received financial support from the European Union and the Senate Department for Urban Development and the Environment.

We were particularly pleased that the German pavilion at the 2014 Milan Expo featured the Terra BoGa project.

The community urban gardening project, run by Berlin’s Freie Universität (FU) and the BGBM, aims to create a space for meeting and learning about urban gardening and permaculture. An area of 500 m² has been made available, where students of various subjects and from different universities and colleges, FU employees and interested citizens can grow and harvest sustainable crops in raised beds. The project was launched together with Berlin’s Technische Universität (TU) project workshop ‘Permaculture and terra preta in the city and the country’ and the FU’s sustainability initiative SUSTAIN IT, and is being run in cooperation with the Botanic Garden. More information can be found at:

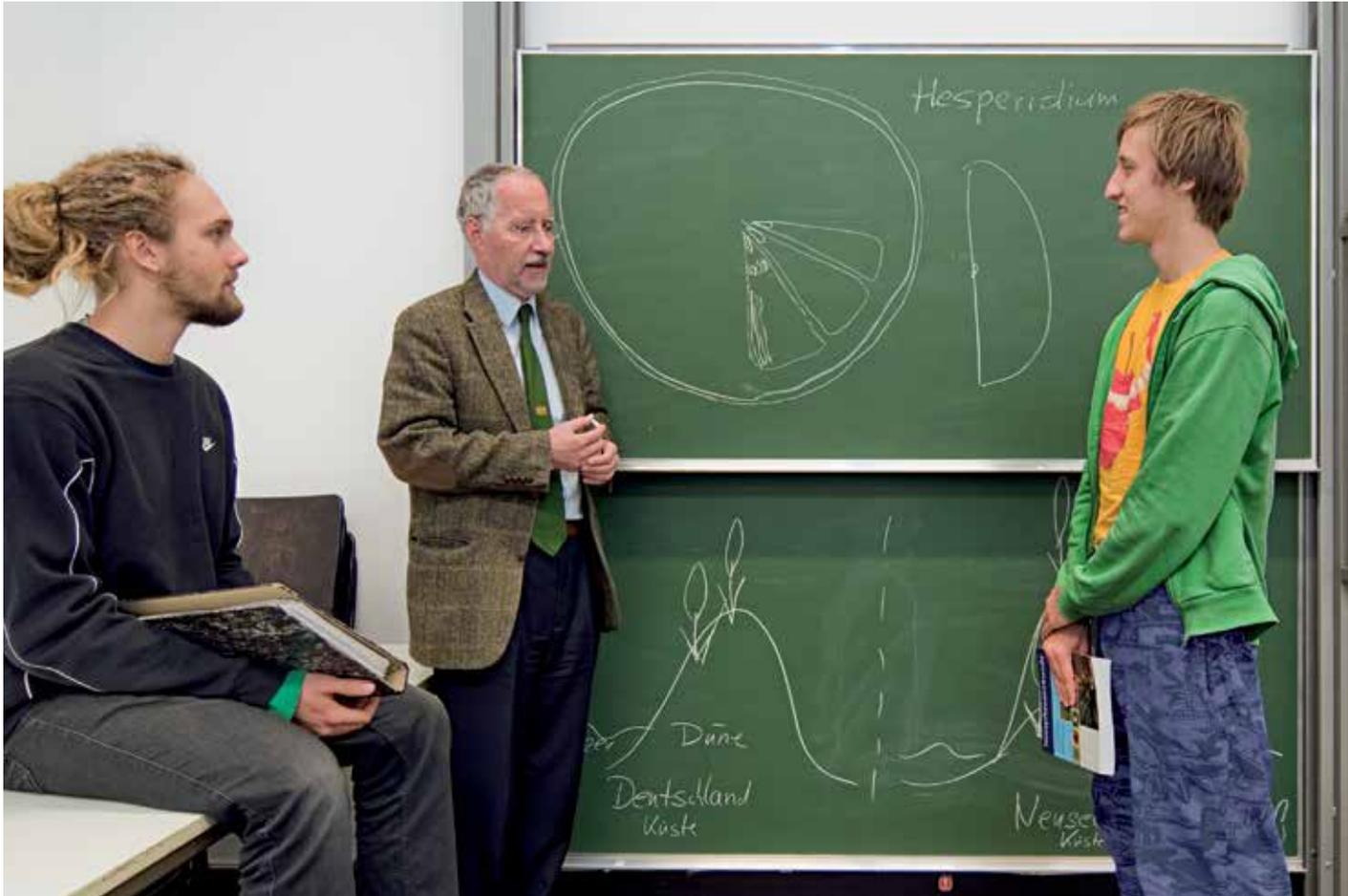
www.fu-berlin.de/sites/sustain/hst/uni_gardening_2015

Sustainable management is taken very seriously, both in public and also privately behind the scenes. A few years ago, for example, the BGBM acquired a powerful garden waste shredder: no average-size machine could cope with the large quantities of waste produced by the Botanic Garden. It might, moreover, at first sight seem an obvious solution for the garden to compost and reuse its green waste. However, in recent decades this option has become extremely expensive, since the composting process is highly labour-intensive. Only very few botanic gardens in Germany still compost their own waste. More usually, garden waste is disposed of and compost is bought in. Even once the cuttings have been shredded, they can only be composted using a compost turner, so we have also purchased one of these. Now the Botanic Garden can compost and reuse all its organic waste.

Our ‘biggest building site’ (literally) are the greenhouses. The Giant Waterlily House and the aquariums beneath it are currently being refurbished, which means that the tropical and sub-tropical aquatic plants cannot be properly viewed. Behind the scenes, however, we are tending and further expanding this special collection, so that these fascinating plants can be displayed again to the public after the refurbishment has been completed. There will also be a new feature: a seawater aquarium with the appropriate flora and fauna. Our gardeners are currently working on developing this sensitive mini-ecosystem.

Behind the scenes

Teaching & Training



Teaching

The Berlin Botanic Garden and Botanical Museum is a scientific institution. Training the next generation of researchers is therefore something very close to our hearts. As a central facility of the Freie Universität, we are closely involved in the academic teaching of biology, especially for topics such as the evolution and diversity of plant life, and the recording, description and preservation of biodiversity. Since 2011, we have offered a special module – ‘Collection management and curation’ – for Master’s students. This module gives prospective scientists an insight into the varied tasks involved in running a natural history research and collection institution. They can learn directly from our curators the most important techniques and practices involved in collection management.

Other academic disciplines also use our garden and museum as interesting places of learning and teaching. Every year, teaching staff from the Freie Universität and other Berlin higher-education institutions organise teaching sessions here on a broad range of subjects, such as biology, pharmacy, horticulture, greenhouse techniques, even business and quality management. We also provide support to many university courses, on, for example, biology- or pharmacy-related topics, by collecting fresh plant material and making it available. Every year we provide as many as 15,000 plants and plant parts to such courses.

Training

As well as academic teaching, traditional vocational training is also very important in the BGBM. We offer a three-year training programme in decorative plant and perennial plant cultivation. We also support training in other professions by organising special vocational guided tours. These visits are geared, for example, to prospective pharmacy assistants and medical technicians, florists, food chemists and cooks. Every year, together with the Berlin Foundation for Nature Conservation, we also offer two places to young people on their voluntary ecological year.

Each year, BGBM trainees take their final examinations. The 2013 cohort, however, stood out: **Enrico Boettcher**, one of our floriculture students, received the highest possible mark: 1.0. The last time such a mark was awarded in Berlin was 20 years ago, and it was even a first for the Botanic Garden.

Enrico Boettcher trained with us from September 2010 until August 2013, and worked mostly on the tropical greenhouse collections, with bromeliads and orchids. Here he was able to turn what had always been his hobby into his profession. Since childhood, Enrico had been passionate about exotic plants and animals, and had begun early on to collect and look after these. His private collection includes not only various bonsais, but also many thermophilic plants, which he grows in terrariums. These house not only plants, but also his second great passion: snakes and other reptiles. Enrico is now working as a garden consultant and employee of a garden centre and tree nursery in Berlin. We are very proud of his achievements, and hope that in the future he can continue to combine his passion with such exciting work and professional success.

Placements are always possible at the BGBM, for school-age students, trainees or university students. Our placements provide practical insight into the broad range of professions represented in the Botanic Garden and Botanical Museum. As well as gardening-related professions these include, for example, museology, press and public relations work, IT, administration, graphics and many different handicraft trades.

Enrico Boettcher at his favourite spot in the Botanic Garden. During his training, what impressed him most was the Main Tropical Greenhouse, especially because of its size, and the gardening and technical challenges resulting from this.



The most apparent of the projects funded by the Association of Friends is the visitor information system in the Main Tropical Greenhouse, which is to be extended in the next few years to other parts of the garden. The system invites our visitors to think about the plants on display, to ask questions, and to look at topics in greater detail. It is designed to fit in well with the garden exhibits, without being disruptive or overly intrusive. Its design and the ideas behind it are state-of-the-art, and lead visitors smoothly through the garden.



Volunteer helpers

The BGBM has a long tradition of hosting volunteers, and they are always welcome. The voluntary work carried out in the garden is vital to us, and covers a broad range of activities. At the BGBM, volunteers work outdoors and in the greenhouses. They help prepare for exhibitions in the museum, support the activities in the herbarium, and are part of the press and PR team. Many BGBM events and plans would not see the light of day without this valuable help. For all these reasons, therefore, we should like to express our heartfelt thanks to these volunteers.

Are you interested in volunteering at the BGBM?
Get in touch with us at ehrenamt@bgbm.org

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Friends & Supporters

The Association of Friends of the Botanic Garden and Botanical Museum Berlin-Dahlem was set up in 1987. Its members are both passionate plant-lovers, who support the BGBM's work because of this keen interest, and people who wish to help maintain this long-standing Berlin institution. The association now has more than 800 members. By providing financial support, but also by helping as volunteers, these members enable many otherwise impossible projects to take place. The garden could not do without either type of help. For years now, the Flora de Cuba programme has been financed largely by the Association of Friends. As well as receiving exclusive invitations to exhibition openings and other activities at the garden or museum, members can take advantage of an exclusive series of talks on research being carried out at the garden or on botany in general.

Numerous projects have been carried out in recent years, many of which would have been impossible without the support of the 'Freunde' (Friends), as the association is affectionately referred to. Recently, for example, a collecting

trip was organised to Armenia, Azerbaijan and Georgia, to prepare for the special exhibition on the Caucasus.

The visitor information system project also received funds from another of our supporters: the Förderkreis der Naturwissenschaftlichen Museen Berlins e.V. (Support association for Berlin natural science museums). The FNMB, founded in 1978, is a true West Berlin institution, and targets much of its support at the unique Botanical Museum and its Botanic Garden. Without its help, the BGBM could not develop further, or could do so only far more slowly, given the ongoing reduction in available public funding. The FNMB provides financial support for the reorganisation and modernisation of the museum's permanent displays. It also, however, funds publications such as exhibition guides, catalogues and maps of the garden.



So, to put it bluntly, who's going to do all the watering?

As many as 20,000 plant species make up the plant variety of the Botanic Garden, and they need to be cared for. This was an ambitious venture, the success of which has been visible for more than a hundred years. In order to maintain the garden at its current level, plant-lovers have, for some years now, been able to sponsor their favourite plants. Sponsorship lasts for at least a year, and the financial support it provides allows the plant species to continue growing and flourishing. Around 10–12 new sponsorships are arranged by the Botanic Garden every year. Our sponsors are as varied as the plants in our living collection. They may be people who particularly love peonies, or the couple for whom a cactus recalls a particular event in their lives, or maybe someone in public life who wishes to use sponsorship to bring to the attention of the public a particular region or an endangered species.

Sponsorships

N

Facts & Figures

Staff,
affiliated
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2012 – 2014

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Müller, Anne	Schenke, Sybille	Vicente Libotti, Evelyn	

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2012

Visiting scientists, grant holders

International: Prof. Dr Hossein Akhani (Alexander von Humboldt-Stiftung), Iran; Peter Bailey, USA; Andrea Burfeid Castellanos, Spain; Thomas Burguiere, France; Michelle Casanova, Australia; Dr Angelica Cervantes Maldonado (Alexander von Humboldt Stiftung); Prof. Tuncay Dirmenci, Turkey; Nino Eradze, Georgia; Dr Hilda Flores-Olvera, Mexico; Paola Fortini, Italy; Jelena Godrián, Croatia; Robert Gordon, United Kingdom; Eugeniv Gusev, Russia; Mahroo Haji Moniri, Iran; Dr Yeon Han, South Korea; Bianca Regina da Hora Sal, Brazil; Dr Stefanie Ickert-Bond, USA; Dr Nursel İkinci, Turkey; Dr Maxim Kulikovskiy, Russia; Dr Eliane de Lima Jacques, Brazil; David Linton, United Kingdom; Jiri Liska, Czech Republic; Parsatoo Mahdavi, Iran; Daniela Maric Pfannkuchen, Croatia; Dr Aleli Morales, Cuba; Ayyub Mutallimov, Azerbaijan; Reza Naderi, Iran; Prof. Hugo Navarrete, Ecuador; Dr Anush Nersesyan, Armenia; Slawomir Nowak, Poland; Dr Helga Ochoterena, Mexico; Amir Pahlevani, Iran; Nils Paulhe, France; Dr Martin Pfannkuchen, Croatia; Len Platt, United Kingdom; Dr Rosa Rankin, Cuba; Prof. Dr Rowan Sage, Canada; Josef Schöpfer, Switzerland; Derek Scott, United Kingdom; Dr Shamil Shetekauri, Georgia; Prof. Marpha Telepova-Texier, France; Nicholas Turland, USA; Zehuan Wang, China; Prof. Paulo Windisch, Brazil; Katja Wolfram, Belgium; Melaku Wondafrash, Ethiopia.

National: Maria Albrecht, Frankfurt; Joachim Daumann, Karlsruhe; Hella Donner-Heise, Bayreuth; Hartmut Egdemann, Lübeck; Monika Gomes, Stuttgart; Dr Günther Gottschlich, Tübingen; Hans Graf, Lauchheim-Röttingen; Prof. Dr Wolfgang Hennig, Kranenberg; Dr Florian Jansen, Greifswald; Sonja Kistenich, Rostock; Dr Hermann Manitz, Jena; Volkert Meng, Göttingen; Berthold Meyer, Mainz; Prof. Dr Kai F. Müller, Münster; Prof. Dr Dietmar Quandt, Bonn; Dr K. Stachura-Suchoples, Berlin; Ben Stöver, Münster; Tanja Weibulat, München.

2013

International: Prof. Erdag Adnan, Turkey; Dr Mariam Aghababyan, Armenia; Prof. Dr Galib Akaydin, Turkey; Prof. Dr Hossein Akhani, Iran; Dr Ana Claudia Araújo, United Kingdom; Dr Mary Barkworth, USA; Andrea Burfeid Castellanos, Spain; Francine Costa Assis, Brazil; Dr Cristiane Snak, Brazil; Aida Dadashova, Azerbaijan; Mitsy Diaz, Peru; Prof. Dr Panayotis Dimopoulos, Greece; Dr Petr Dvorák, Czech Republic; Banessa Falcón, Cuba; Lusine Ghulikyan, Armenia; Dr Ana Giulietti, Brazil; Jelena Godrián, Croatia; Dr Jorge Gutiérrez, Cuba; Julian Harber, United Kingdom; Dr Ray Giulietti, Brazil; Reinout Havinga, Netherlands; Prof. Gregoris Iatrou, Greece; Dr Stefanie Ickert-Bond, USA; Dr Sabine Karg, Denmark; Anahit Khachatryan, Armenia; Sandro Kolbaia, Georgia; Dr Maxim Kulikovskiy, Russia; Dr Sampath Kumar, United Kingdom; Dr Sara Magrini, Italy; Maryam Malekmohammadi, Iran; Dr David Mann, United Kingdom; Octavio Camilo Maguera Céspedes, Bolivia; Daniela Maric Pfannkuchen, Croatia; Hanna Margonska, Poland; Luiz Olmedo Martínez Zamora, Colombia; Edgar Serafin Mayta Chipana, Bolivia; Dr Linda Medlin, France; Ayyub Mutallimov, Azerbaijan; Parvana Nabiveva, Azerbaijan; Dr Anush Nersesyan, Armenia; Dr Floriano Pastore, Brazil; Dr Martin Pfannkuchen, Croatia; Marcin Piwczynski, Poland; Prof. Dr Carlos Ramírez, Chile; Dr Rosa Rankin, Cuba; Dr Frédéric Rimet, France; Prof. Dr Alexandre Salino, Brazil; Dr Carlos Sánchez, Cuba; Rozijane Santos Fernandes, Brazil; Harutyun Sargsyan, Armenia; Prof. Dr Tuncay Saritas, Turkey; Alexey Serengin, Russia; Raquel Stauffer Viveros, Brazil; Prof. Dr Heiki Tamm, Estonia; Carla Teixeira, Brazil; Rosa Trobajo, Spain; Prof. Dr Dimitrios Tzanoudakis, Greece; Roel Westendorp, Netherlands; Helena Wieclaw, Poland; Katja Wolfram, Belgium.

National: Dr Miguel Alvarez, Bonn; Andrea Fuchs, Neuglobsow; Rui Jie Bao, Hamburg; Zi Yi Ni, Hamburg; Prof. Dr Erwin Bergmeier, Göttingen; Dr Karl Peter Buttler, Frankfurt; Dr Andreas Franzke, Heidelberg; Dr Günther Gerlach, München; Till Hägele, München; Dr Gudrun Kadereit, Mainz; Dr Hermann Manitz, Jena; Rudolf May, Bonn; Prof. Dr Dietmar Quandt, Bonn; Prof. Dr Kai F. Müller, Münster; Ulf Schiefelbein, Rostock; Dr K. Stachura-Suchoples, Berlin; Susanne Starke, Greifswald.

2014

International: Ali Bagheri, Iran; Dr Rosalina Berazaín, Cuba; Earl Chagas, Brazil; Philippe Clerc, Switzerland; Cvetomir Denchev, Bulgaria; Mitsy Diaz, Peru; Ivan Frolov, Czech Republic; Melanie Garland, Italy; Lusine Ghulikyan, Armenia; Jelena Godrian, Croatia; Irakli Grdzlishvili, Georgia; Elnara Guliveva, Azerbaijan; Dr Jorge Gutiérrez, Cuba; Mahroo Haji Moniri, Iran; Paola Inofuentes, Bolivia; Anahit van Khatchatr, Armenia; Jacob Koopman, Poland; Grazia Maria Lepore, Italy; Dr Zlatko Levkov, Macedonia; Maryam Malekmohammadi, Iran; Dr Daniela Maric Pfannkuchen, Croatia; Jeferson Miranda Costa, Brazil; Francisco Morales, Costa Rica; Olga Moupagitsoglou, Brazil; Tania Moura, Brazil; Dr Soninkhishig Nergui, Mongolia; Dr Anush Nersesyan, Armenia; Prof. Dr Ryszard Ochyra, Poland; Teresa Ortuño, Bolivia; Brígido Peguero, Dominican Republic; Dr Martin Pfannkuchen, Croatia; Joanna Pierzchalska, Poland; Tural Qasimov, Azerbaijan; Dr Rosa Rankin, Cuba; Harut Sargsyan, Armenia; Marcelo Sellaro, United Kingdom; Dr Alexander Sennikov, Finland; Dr Alexey Seregin, Russia; Raquel Stauffer Viveros, Brazil; Carla Teixeira, Brazil; Alejandro Torres Montúfar, Mexico; Angelo Troia, Italy; Prof. Dr Iván Valdespino, Panama; Johanna Vargas, Colombia; Anna Vari, Hungary; Helena Wieclaw, Poland.

National: Dr Peter Borgmann, Osnabrück; Dr Florian Jansen, Greifswald; Frederico Luebert, Bonn; Dr Hermann Manitz, Jena; Annemarie Radkowitzsch, Karlsruhe; Dr Oscar Romero, Bremen; Ulf Schieferbein, Rostock; Dr K. Stachura-Suchoples, Berlin.

Evelin Bartels; Lothar Bartels; Petra Bernemann; Sabine Brocher; Ingrid Bulkowski; Lotte Burkhardt; Uschi Christahl; Sonja-Maria Czérkus-Yavuz; Gabriele Deroche; Aleksander Dukic; Gabriele Ellendt; Heidemarie Franke; Claus Fricke; Wolfgang Froberg; Christina Geils; Gudrun Genschow; Bettina Gmelin; Irene Grametzki; Jörg-Peter Groß; Barbara Grusche; Stefani Grzeskowiak; Lutz Gutzeit; Ingo Haas; Ingrid Hancke; Petra Hansel; Susanne Heidrich; Anette Höner; Monika Hornung; Margit Jaroschewski; Heike Jaschhof; Margit Keipke; Jürgen Klawitter; Anja Clara Kraft; Hartmut Krebs; Marianne Kubicki; Erik Lachmann; Erich Liebert; Erica Mahr; Helga Malks; Cosima Mandler; Christine Matuschewski; Gerhard Neumann; Regina Ostrower; Tjaldra Picksak-Schmidt; Dr Barbara Poland; Claudia Quasthoff; Klaus Reiche; Maria Rosken; Hans J. Schäfers; Gudrun Scharte; Silke Schaub; Cora-Beate Schaumann; Karin Schenk; David; Schniegler; Heide-Marie Schrader; Jutta Schrader; Birgit Schubert; Rodney Smith; Regina Stark; Tom Stawowy; Christa Strecker; Julia Teply; Hans-Joachim Tetzlaff; Marit Toepffer; Gabriele Voß; Irina Weinedel-Liebau; Inge Weinert; Dietmar Weinert; Sabine Zehrer.

Stephanie Maiwald; Carina Fietkau; Simone Gottlieb; Josefin Hartlieb; Rene Hartwig; Maria Kondra; Lisa Paul; Silja Rosenbusch; Ece Sarioglu; Mahir Uzunovic.

Volunteers

Voluntary ecological year

Publications **Articles in peer-reviewed journals**

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The BGBM makes available databases and online resources that on the one hand are used for the cataloging of our own collections and on the other present fundamental biodiversity data on groups of organisms or geographical regions. More general service portals are also hosted at the BGBM:

Digital collections at the BGBM

Virtual Herbarium – digital specimen images from the Berlin herbarium

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

LICHCOL – database of the Berlin lichen and fungus herbarium

<http://archive.bgbm.org/scripts/ASP/lichcol>

BoGART – database of the BGBM's living collection

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

Taxonomic information system on organism groups

AlgaTerra – information system on terrestrial and limnic microalgae (regularly updated)

<http://www.algaterra.net>

Bohlmann Files – database of natural substances in the *Compositae*

<http://bohlmann.bgbm.org/bohlmann>

Campanula Portal – global online monograph of the genus *Campanula* (bellflower) (regularly updated)

<https://campanula.e-taxonomy.net/portal>

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

<http://cichorieae.e-taxonomy.net/portal>

DERMBASE – database of scientific names of the family *Dermateaceae* (*Ascomycetes*)

<http://ww2.bgbm.org/projects/dermbase/query.cfm>

IOPIGlobal – International Organization for Plant Information's provisional global plant checklist

<http://archive.bgbm.org/IOPI/GPC/default.asp>

Names in Current Use for Extant Plant Genera (NCU-3e) – standard list of genus names and publication citations for plants, algae and fungi

<http://archive.bgbm.org/iapt/ncu/genera/Default.htm>

Regularly updated online resources and databases

Floras and checklists

Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity – directory of vascular plants and their distribution in Europe and the Mediterranean region (regularly updated)

<http://www2.bgbm.org/EuroPlusMed/query.asp>

Flora of Cuba Database – database of herbarium specimens of the Cuban flora with distribution maps, version 10.0 (Sept. 2014)

<http://www3.bgbm.org/FloraOfCuba>

Flora of Cyprus – a dynamic checklist – online Flora of the vascular plants of Cyprus with illustrations, distribution maps and identification keys (regularly updated)

<http://www.flora-of-cyprus.eu>

Med-Checklist – a critical inventory of vascular plants of the circum-Mediterranean countries

<http://www2.bgbm.org/mcl>

Service portals and software

BioCASE – Biological Collection Access Service for Europe. Portal for BGBM Collections

<http://search.biocase.org/bgbm>

BioCASE – Biological Collection Access Service for Europe. Portal for European Biodiversity (direct access to search catalogue)

<http://search.biocase.org/europe>

BioCASE – Biological Collection Access Service for Europe. Portal for German Phytodiversity (direct access to search catalogue)

<http://search.biocase.de/botany>

EDIT Platform for Cybertaxonomy – open-source software tools and services covering all aspects of the taxonomic workflow

www.cybertaxonomy.eu

EDIT Specimen and Observation Explorer for Taxonomists – access portal for collection data worldwide, optimised for taxonomists

<http://search.biocase.org/edit>

GBIF-D Algae & Protozoa – Global Diversity Information Facility's data portal for algae and protozoa

<http://protists.gbif.de/protists>

IAPT Registration of Plant Names Trial – International Association for Plant Taxonomy's trial database for the registration of newly published plant names

<http://archive.bgbm.org/registration/QueryForm.htm>

UTIS – Unified Taxonomic Information Services: taxonomic backbone for the European Biodiversity Observation Network (EU-BON)

<http://cybertaxonomy.eu/eu-bon/utis>

Research

Externally funded projects

Funding body	Project	Project leader	Duration
BfN	Red Lists – preparatory phase	Berendsohn	2011–2015
BfN	Integration of ex-situ and in-situ measures of endangered species of flowering plants in Germany – a model project in the context of implementing the Global Strategy for Plant Conservation (GSPC)	Borsch	2012–2016
BfN	WIPs-De – network for the protection of endangered wild plants under Germany's special responsibility	Stevens	2013–2018
BLE	WEL (Genbank Wildpflanzen für Ernährung und Landwirtschaft) – gene bank for crop wild relatives	Borsch	2009–2014
BMBF	GBIF – Global Biodiversity Information Facility	Berendsohn	2010–2014
BMBF	EDAPHOBASE – GBIF-soil zoology information system	Berendsohn	2010–2012
BMBF	German Barcode of Life (GBOL, sub-project 5a)	Borsch	2012–2015
BMBF	Pilot project in partnership with the Botanic Garden of Bogotá	Borsch	2013–2015
BMBF	EDAPHOBASE – GBIF-soil zoology data base 2, information system for taxonomy, literature and ecology	Güntsch / Müller	2013–2017
DAAD	Recording and access to the biodiversity of phytoplankton of the northern Adriatic: taxonomy, systematics, genetics, ecology and data management	Jahn	2012–2013
DFG	AnnoSys – a generic annotation system for biodiversity data, phase I	Berendsohn	2011–2014
DFG	reBIND – development of workflows and software components for rescuing legacy databases from biodiversity sciences	Berendsohn	2011–2014
DFG	BiNHum – Biodiversity Network of the Humboldt-Ring	Berendsohn	2012–2015
DFG	StanDAP-Herb – a process-optimised standard method for the indexing of digital herbarium specimens	Berendsohn	2014–2017
DFG	AnnoSys – a generic annotation system for biodiversity data, phase II	Berendsohn	2014–2017

Funding body	Project	Project leader	Duration
DFG	GFBio – German Federation of Biological Data	Güntsch	2014–2015
DFG	GGBN – Global Genome Biodiversity Network	Güntsch / Dröge	2014–2015
DFG	ABCD 3.0 – a community platform for the development and documentation of the ABCD standard for natural history collections	Güntsch	2014–2017
DFG	Design and evaluation of DNA-barcoding high-throughput methods for analysing diatom diversity: a test case along a south-north gradient in central Europe (Rivers Neiße/Oder)	Jahn	2011–2014
DFG	Development of a subject indexing system for collections of the northern hemisphere flowering plant genus <i>Campanula</i>	Kilian	2012–2015
DFG	DIGIBOTZ – digitisation of German botanical journals of the period 1753–1914	Lack	2011–2014
DFG	Consequences of polyploidy: phylogeny, phyloecology, and expression of duplicate genes in <i>Leucanthemum</i> Mill. (<i>Compositae</i> , <i>Anthemideae</i>)	Vogt	2009–2014
EU	BHL – Biodiversity Heritage Library	Berendsohn	2009–2012
EU	ViBRANT – Virtual Biodiversity Research and Access Network for Taxonomy	Berendsohn / Güntsch	2010–2013
EU	i4Life – Indexing for Life	Güntsch / Berendsohn	2010–2013
EU	OpenUp! – Opening up the Natural History Heritage for Europeana	Berendsohn	2011–2014
EU	EU BON – Building the European Biodiversity Observation Network	Güntsch / Berendsohn	2012–2017
EU	BioVeL – Biodiversity Virtual e-Laboratory	Güntsch	2011–2014
EU	Pro-iBiosphere – coordination and policy development in preparation for a European Open Biodiversity Knowledge Management System, addressing acquisition, curation, synthesis, interoperability and dissemination	Güntsch / Berendsohn	2012–2014

Research

Externally funded projects

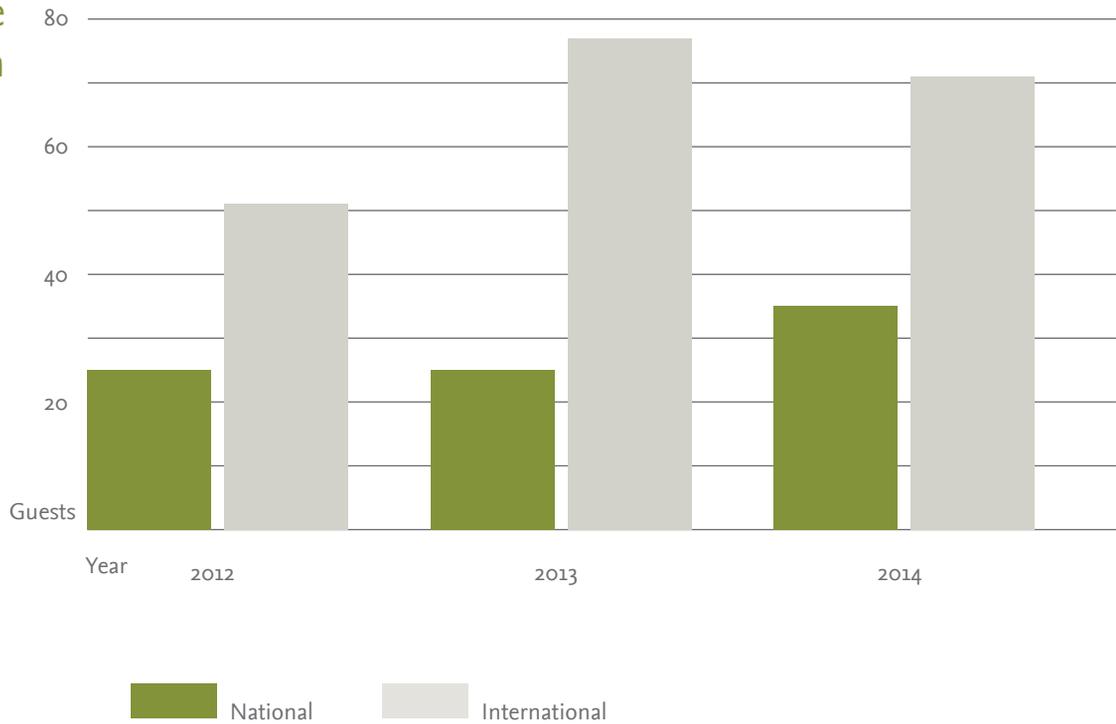
Funding body	Project	Project leader	Duration
EU	SYNTHESYS II & III – Synthesis of Systematic Resources, Information Network of European Natural History Collections – Networking activities	Berendsohn	2009–2017
EU	SYNTHESYS II & III – Collection access component	Jahn	2009–2017
Landestalsperrenverwaltung des Freistaates Sachsen	Identification of plankton algae	Jahn	2012
Mellon Foundation	Digitisation of the Willdenow Herbarium	Berendsohn	2010–2013
Mellon Foundation	Digitisation of the Bridel Herbarium and type specimens of lichen and fungi	Berendsohn	2013–2014
Volkswagenstiftung	Developing tools for conserving the plant diversity of the Transcaucasus	Borsch / Korotkova	2011–2014
Verein der Freunde	Phylogeny of <i>Hylocereeae</i> (<i>Cactaceae</i>)	Borsch / Korotkova	2012–2013
Verein der Freunde	<i>Flora de Cuba</i> and endemism in Cuba and the Caribbean	Borsch / Fuentes	2012–2013 2013–2014 2014–2015
Verein der Freunde	Funding of acquisitions for the library of the BGBM	Kilian	2012–2013
Verein der Freunde	<i>Asterales</i> collecting and research trip in southwest China in partnership with the Kunming Institute of Botany, Chinese Academy of Sciences	Kilian / Raab-Straube	2012–2013
Verein der Freunde	Review of the historic data of long-term seed storage according to current standards	Stevens / Zippel	2012–2013
Verein der Freunde	The genus <i>Philodendron</i> (<i>Araceae</i>) at the BGBM: development of the living collection and preliminary studies on its phylogeny	Köster	2012–2013
Verein der Freunde	Indexing of the herbarium collections of the eastern Mediterranean for the BGBM's Euro+Med focus area	Vogt / Stevens / Parolly	2012–2013
Verein der Freunde	Chemical analysis of Aegean lichens	Sipman	2012–2013 2014–2015
Verein der Freunde	Ex-situ conservation of endemic and endangered species from Cyprus at the BGBM – fourth collecting trip	Hand	2013–2014

Funding body	Project	Project leader	Duration
Verein der Freunde	Travel subsidy – El Salvador <i>Nova Silva Cuscatlanica</i>	Gruber / Berendsohn	2013–2014
Verein der Freunde	Support for a lichenological-botanical research and collecting trip in the northern Aegean (Greece)	Sipman / Raus	2013–2014
Verein der Freunde	Funding of scientific-institutional collaboration with the Herbario Nacional de Bolivia	Borsch	2013–2014
Verein der Freunde	Funding: visitor information for the Dahlem Seed Bank	Stevens / Grotz	2013–2014
Verein der Freunde	Funding of acquisitions for the BGBM's library	Lack	2013–2014
Verein der Freunde	Caucasus collecting trip (Armenia, Azerbaijan, Georgia)	Parolly / Kilian / Korotkova	2013–2014
Verein der Freunde	Morphological and genetic stability of diatom cell lines in culture	Enke	2013–2014 2014–2015
Verein der Freunde	The genus <i>Philodendron</i> (<i>Araceae</i>) in Colombia: a collecting expedition as a basis for the study of its phylogeny	Köster	2014–2015
Verein der Freunde	Phylogeny and family classification in the <i>Caryophyllales</i> raphides clade	Hernández / Borsch	2014–2015
Verein der Freunde	Collecting trips in the North Caucasus (Krasnodar region)	Korotkova / Parolly	2014–2015
Verein der Freunde	Research and collecting trip in Armenia	Borsch / Sipman	2014–2015

Other regional cooperation partners | consortia:



Visitors to the herbarium



Collections **Living collection (Parkland & Greenhouses)**

Holdings	2012	2013	2014
Total number of families	305	310	312
Total number of genera	3237	3316	3364
Total number of species	15,345	15,797	16,190
Total number of taxa (incl. subspecies, varieties etc.)	18,388	18,894	19,336
Total number of accessions	33,363	34,325	35,162
Wild provenances (%)	57.8	58.5	58.9
Arrivals/Releases	2012	2013	2014
Incoming accessions	2718	1637	1301
Outgoing accessions	1091	675	464
Accessions released to other gardens	418	216	200
Plant (parts) made available for teaching	20,484	9662	11,467

Herbarium

Holdings	2012	2013	2014
Total number of specimens	c. 3.55 m.	c. 3.6 m.	c. 3.75 m.
Type specimens	> 40,000	> 40,000	> 40,000
Garden herbarium	48,941	49,610	49,965
New additions	2012	2013	2014
Total new additions, of which	47,900	45,967	155,894
through donation	37,104	37,550	148,839
through exchange	3193	2677	3154
through purchase	823	1453	1049
through our own collecting activities	6111	3660	2489
New additions to the garden herbarium	669	627	363
Lending, exchange, visitors – herbarium	2012	2013	2014
Loan enquiries	273	251	275
Loans from Berlin to other institutions, number of specimens (shipments)	4417 (160)	2953 (129)	5238 (146)
Loans to Berlin from other institutions, number of specimens (shipments)	1456 (47)	2632 (43)	2716 (32)
Number of institutions with whom we had loan exchanges	207	172	178
Specimens permanently given away to exchange partners	287	4002	2301
Visiting scientists	91	114	115
Digital herbarium	2012	2013	2014
Newly digitised specimens, of which	17,115	14,654	5521
on account of loan enquiries	426	1025	438
in the context of the Mellon project	16,689	13,629	5083
Total number of specimens available online	127,000	143,450	148,971
Downloads			65,933

Collections **Seed bank**

	2012	2013	2014
Holdings (number of accessions)	5563	6290	6312
New additions (number of accessions)	632	727	22
Inclusions in the Index Seminum,	no Index Sem.	3599 ¹	3127
of which seed samples sent out	no Index Sem.	Index Sem. 2013/2014:	8795
Domestic	no Index Sem.	Index Sem. 2013/2014:	2171
International	no Index Sem.	Index Sem. 2013/2014:	6624
Recipients of seed samples	no Index Sem.	Index Sem. 2013/2014:	298

¹ Index Seminum for the year 2013–2014

DNA bank

	2012	2013	2014
Holdings (number of DNA samples)	8374	12,100	14,600
New additions, of which	182	3726	2500
through donation, exchange with partners	56	1855	
through our own research activities	35	2333	2500
DNA samples sent out (number)	37	29	50

Holdings & Catalogue

Library

	2012	2013	2014
Monographs and bound journals	202,465	204,408	206,508
Current journals with print editions	996	962	936
Offprints	143,285	143,443	143,727
CD-ROMs, DVDs and video cassettes	479	494	505
Microfilm and microfiche titles	4175	4175	4175

New additions

	2012	2013	2014
Monographs, of which	898	856	1033
through purchase	245	189	126
through exchange / donation	680	667	907
Bound journals, of which	984	1088	1067
through purchase	328	227	290
through exchange / donation	656	861	777
Offprints	320	158	284
CD-ROMs and DVDs	17	14	11
Expenditure on contributions to databases and online journal packages	12,581	16,514	23,837

Museum **Special exhibitions**

Flora's Treasures: Recording the Green World, 27.04.2012 – 24.02.2013

Coffee: A Global Success, 17.05.2013 – 23.02.2014

Caucasus: Plant Diversity between the Black & Caspian Seas, 16.05.2014 – 22.02.2015

Gallery exhibitions

- Highgrove Florilegium: From the Garden of HRH The Prince of Wales, 28.03 – 03.06.2012
- Nature Knows No Waste: Terra Preta. An Opportunity for Sustainability, 14.06 – 30.09.2012
- Metamorphoses: In Dialogue with Tree Bark. Original Photographs and their Digital Manipulation by Elke Hickisch, 11.10 – 30.12.2012
- Glimmer of Light: Photographs by André Obermüller, 17.01 – 10.03.2013
- José Martí: Entre la tala y la semilla, Between Transience and a Fresh Start. Watercolours by Jorge Duporté, Cuba, 21.03 – 02.06.2013
- Water for All! – exhibition organised by the German Botanic Gardens Association as part of UNESCO's 'International Year of Water Co-operation 2013', 13.06 – 01.09.2013
- BGBM Visitor Centre: Surveyors' Designs from the Competitive Review Process – exhibition organised by the Senate Department for Urban Development and the Environment, displayed in the Rousseau Room in the New Glasshouse, 27.06 – 10.07.2013
- Wild New Territories – art exhibition displayed in the gallery and garden, 14.09 – 17.11.2013
- Naturschön: Painting by Ute Wöllmann, 28.11.2013 – 23.02.2014
- Crocher en Plein Air: Crochet by Katharina Krenkel – displayed in the gallery and garden, 06.03 – 08.06.2014
- Quinoa: On Trend – exhibition organised by Biodiversity International, the German Society for International Co-operation (GIZ) and the Federal Ministry for Economic Co-operation and Development (BMZ), 27.06 – 31.08.2014
- Branches – Seeds – Petals; Egg Tempera – Tracing Paper – Natural Materials: Art by Katja Wunderling, 18.09 – 16.11.2014
- The German Forest: Photographs by Sabine Wenzel, 27.11.2014 – 08.02.2015

Travelling exhibitions

Palms was on display from July 2013 to October 2013 at the Royal Botanic Garden Edinburgh. The exhibition **Ploughing, Rafting, Hunting**, created in cooperation with BDLAM and DAI, was shown from April 2012 to October 2012 in the Freyenstein Archaeological Park, Wittstock, November 2012 to June 2013 in the Dominican monastery of Prenzlau, and since July 2013 in Freyenstein.

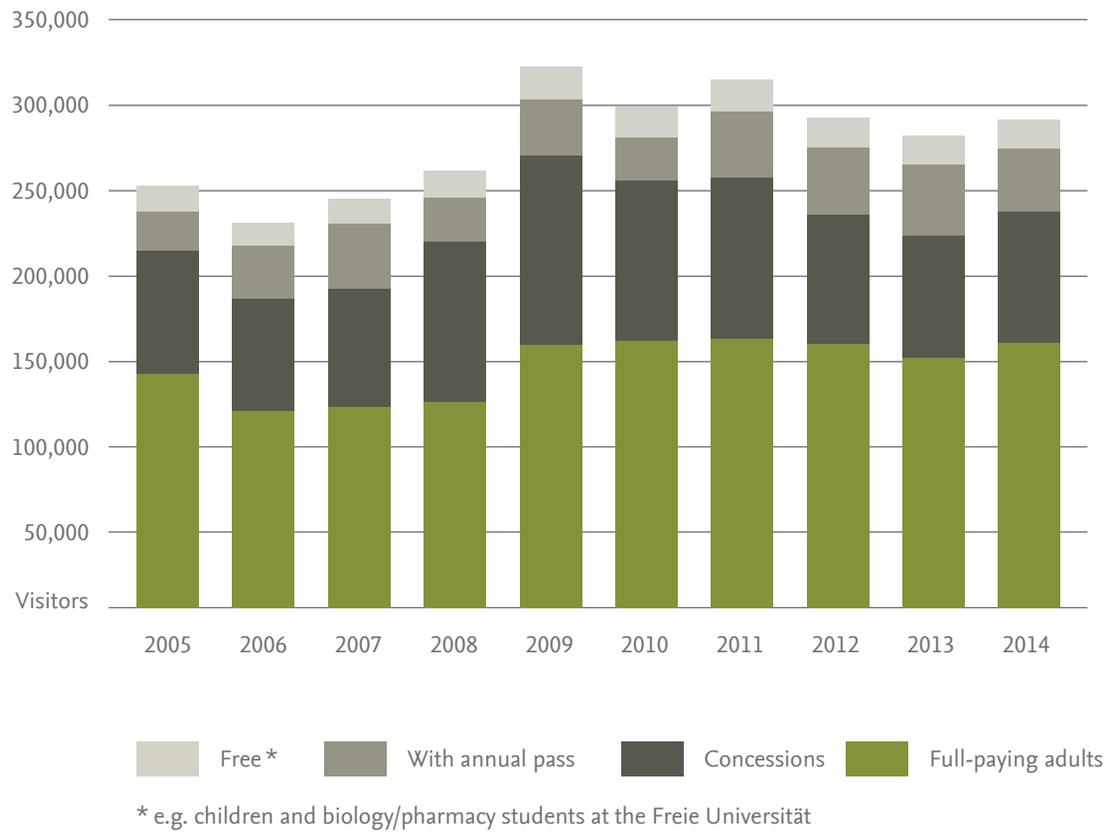
Lending – Museum	2012	2013	2014
Loans, number of specimens (shipments)	155	20	16
Number of institutions with whom we had loan exchanges	3	5	4
Visiting scientists	91	114	115

Press and
public relations*

	2012	2013	2014
Press releases	28	33	28
Newsletter	12	12	12
Print mentions	254	394	405
TV reports	38	33	26
Radio reports	72	85	55
Online posts	206	164	100

* Figures without using clipping service.

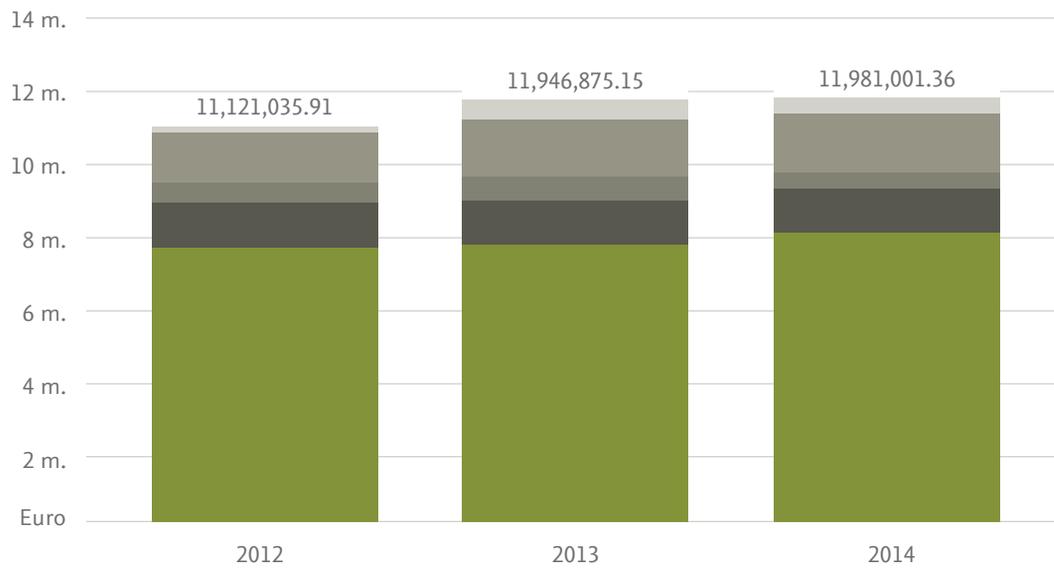
Visitor numbers



Events Our best-attended events

Perennials markets (Spring & Autumn)	25,629
Botanical Night	12,000
Tropical Nights	6861
Halloween	6571
Summer concerts	5703
Cactus fair	3346
Wine festival	2994
Palm symphony	2119
Bonsai exhibition	1388
Bird exhibition	1772

Budget



- State grant
 - Entrance fees
 - Own income (admission fees, events, hires)
- External funding for research and collections (including donations)
 - Endowments and bequests

Imprint

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