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# BOTANICAL GARDENS IN THE BALTIC REGION: VALUES AND ARTS

## Ogrody botaniczne w regionie Morza Bałtyckiego: wartości poznawcze i estetyczne

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**STRESZCZENIE**

Artykuł podejmuje tematykę znaczenia ogrodów botanicznych we współczesnym społeczeństwie. Przedstawia on znaczenie naukowe, dydaktyczno-wychowawcze i rekreacyjne tych placówek oraz ich rolę w ochronie flory na przykładzie trzech ogrodów botanicznych w regionie morza bałtyckiego. Artykuł opisuje historię, cele i szczególne wartości poznawcze przykładowych ogrodów botanicznych. Wartości estetyczne i funkcjonowanie tych placówek opisano w kontekście zmienności sezonowo-klimatycznej. Odgrywajac krytyczną rolę w rozwoju zachowawczym, ogrody botaniczne wnoszą cenny wkład w przekazywanie dziedzictwa botanicznego przyszłym pokoleniom.

**ABSTRACT**

The aim of this report is to provide an introduction to botanical gardens and their values in contemporary society. Scientific, educational, recreational, and conservation worth are considered. Further, three botanical gardens of the Baltic Sea region are discussed in depth, with a comparison between the three institutions. Such distinguishing characters of botanical gardens include their history, purpose, special value, and seasonal variation. Botanical gardens are helping to lead society into the future, playing a critical role in sustainable development.

**Key words:** applied botany, art, botanical garden, conservation, education, plants, sustainability, value

## INTRODUCTION

### An escape

We always dream of places where we can 'get away from it all,' and find peace and solitude amidst our increasingly busy world. Sadly, it is becoming more and more difficult to find such places in the confines of the real world. As lifestyles adapt to changing times, technology continues to push us forward into the future, and 'success' becomes the keyword in many people's lives, there is less time to escape from the pressures of daily life, even though now it is more necessary than ever before. One escape that we have managed to find in our high-speed, stress-driven society is botanical gardens. Often nestled in urban settings, these institutions can truly offer a new, unexplored world to visitors-and an escape from their ordinary routine. For us, having always lived in regions with temperate climates, it is exciting to see plant species from other parts of the world-such as those from tropical and sub-tropical climates. It affords one the opportunity to better appreciate and understand these other regions as well as the inhabitants residing in them. Gardens appeal to one's senses-with wonderful smells and sights to behold. Spending time in botanical gardens helps to stimulate desire to learn and gain knowledge, and the gardens provide a perfect environment in which to do so, as they offer educational opportunities in botanical sciences and a number of other areas. We also appreciate the art of botanical gardens, found in varying displays and organizations of plants and other aspects found throughout. These places can tru-

ly be an escape from the 'real world,' affording the chance to feel closer to nature and our genetic origins. Flowering plants dominated this planet long before humans made their first appearance, and it may indeed be that we have a continued need to perceive an organized natural world. Moreover, according to a recent research, the visits in botanical garden are interesting educational experience for primary school children (Tunnicliffe 2001).

**Defining botanical gardens**

A single definition for botanical gardens can be hard to come by. A simple new description of botanical gardens is as scholarly places for the research and conservation of plants. According to Weier et al. (1974) botanical gardens store and are concerned with dissemination of the plants. The WCU (World Conservation Union) provides a more precise list of defining criteria to be considered in whole or in part for botanical gardens. Among this list of criteria are the following:

- A reasonable degree of permanence
- An underlying scientific basis for the collections
- Proper documentation
- Monitoring of the plants in the collections
- Adequate labeling of the plants
- Open to the public
- Communication of information to other gardens, institutions and the public
- Exchange of seed or other materials with other botanical gardens
- Undertaking of scientific or technical research on plants in the collections
- Maintenance of research programs in plant taxonomy in associated herbaria

The WCU's list is not necessarily a comprehensive summary of those activities required of botanical gardens, but rather a criteria list (endorsed also by the WWF, FAO, UNEP and UNESCO) which can be used to set true botanical gardens apart from others.

There is no one agency giving legal accreditation to botanical gardens. Today, however, there are approximately 2000 such gardens recognized by institutions like the WCU, WWF, BGCI, and UNESCO found throughout the world. Europe has the greatest concentration of botanical gardens in the world (Maunder et al. 2001). They cultivate extensive collections of the plants. It is widely accepted that minimum 'requirements' for a botanical garden are to maintain a well-documented collection of living plants for the purposes of scientific research, conservation, display and education. In fact, Botanic Gardens Conservation International (BGCI) states that a botanic garden differs from a park or other public garden because it contains scientifically ordered and maintained collections of plants, usually documented and labeled. Furthermore, BGCI explains that these gardens are open to the public for education, recreation and research. Conservation work is also an integral component for botanical gardens, and they can often be associated with universities, though not necessarily. Botanical gardens serve similar functions as 'normal gardens' in aesthetics and recreation; however, their main function relates to botany-often an educational purpose-and requires a documented plant collection for students and others to facilitate learning.

**Purposes of botanical gardens: values and arts**

It becomes clear when defining botanical gardens that their purposes can be many-varying by the specific garden and its operations. We have already seen that botanical gardens should maintain documented collections of living plants for research and educational purposes. Also, they should take part in international seed exchange programs for scientific purposes, provide public education and places for recreation, and serve in plant conservation roles-even as survival sanctuaries for threatened plant species. It is true that botanical gardens serve a crucial purpose of conserving plant diversity, which is critical for sustainable development and ultimately the future of our society. BGCI explains that there may be over 80,000 species of plants (out of the some 270,000 know plant species in the world) in cultivation in botanical gardens, and many gardens have important conservation collections of rare or threatened plant species. Further, these gardens manage protected areas in and out of their areas to promote biodiversity, which has been lost to a great extent at the expense of collecting wild plants for horticulture, medicine and food.

The value of botanical gardens includes ecosystem service, economic benefit, aesthetic value, and ethical value. Botanic Garden Con-

**Fig. 1.** Botanical garden of the Polish Academy of Sciences.
**Fot. 1.** Ogród botaniczny Polskiej Akademii Nauk.

servation International states that "the intrinsic value of botanical gardens is constant," although their perceived value can change depending on the economic status and current situations. In order to maintain a botanical garden's relevance, it is necessary to adjust the 'weightage' of four main values: recreation (can also include aesthetics and artistic value), education, research and conservation. BGCI suggests that by managing these components appropriately for the demands of the current times, botanical gardens can be relevant and important for a nation and its communities. A garden can make important contributions to a country's development, health, education and even economic growth.

The artistic value of a botanical garden can be intrinsic, though still largely determined by the directors and staff of the establishment. Our need to perceive an organized natural world paves the way for our appreciation of botanical gardens in their natural beauty. As gardens appeal to our senses, it is easy to realize this innate need. Aesthetic value can be changed and even increased with the use of horticultural practices and creative layout and design plans. Also, architecture and layout of greenhouses in botanical gardens can add to the artistic value of the institution. Many botanical gardens organize special programs throughout the year that allow visitors to see the gardens in a 'different light,' so to speak (sometimes literally) and appreciate them in a new way. Programs such as this often contribute greatly to the recreational and artistic value of botanical gardens.

**Evolution of botanical gardens**

Throughout man's history, botanical gardens have had very different roles in society and the botany (Forrest 2006). Gardens can be found in almost all cultures, both past and present. The first recognized botanical gardens of the western world were herbal, or 'physics gardens,' created by physicians and medicine students to grow plants with medicinal uses. In Pisa, Italy in 1543 and Padua, Italy in 1545, the first gardens of this nature were established (Weier et al. 1974; Terwendionisius 1994; Tomasi 2005). These gardens were devoted to even broader studies of plants, including economic and horticultural studies. Other medicinal gardens from the

16th and 17th centuries include those in Zurich (1560), Leipzig (1580), Montpellier (1593), Paris (1597), Oxford (1621), Edinburg (1670) and Berlin (1679) (Weier et al. 1974; CE 2005).

During the 17th and 18th centuries, botanical gardens in the western world were then established to study new plants introduced to Europe. The Royal Botanic Garden, Kew, England, founded in 1759, provides a good example of this type of garden (Chambers 1763). It was very important in the introduction and development of new crop plants from colonial (and furthermore tropical) regions, including crops such as rubber, banana, tea, pineapple, coffee, and cacao (CE 2005). Colonial gardens, such as the Calcutta Botanical Garden and Royal Botanical Gardens Pamplemousses in Mauritius, were created by governments as instruments of colonial expansion and commercial development.

In the 18th and 19th centuries, Linnaean gardens were widely established. Through this time, the strict utilitarian display of plants gave way to a very comprehensive study of plants. This group of gardens gets its name from Carolus Linnaeus, the father of modern taxonomy, whose work laid the basis for gardens to be set up to show plant relationships by classification. New material was coming into Europe from all over the New World to be exhibited and studied in botanical gardens. Since taxonomy was gaining so much prominence, the gardens were now taking more pride in their herbaria, laboratories and libraries instead of their living collections. Around the time of the 19th and 20th centuries, civic gardens were growing in popularity. Municipal gardens, such as the Missouri Botanical Garden (1859), were being founded to advance the horticultural aspects and recreational value of their living collections (Weier et al. 1974; Rudolph 1991; Cook 1995).

In the last century, two different types of botanical gardens have been emerging. Specialist gardens like experimental stations and orchid gardens have been highlighting specific research on particular plant groups. This has provided for great advancement of gardens as leading research centers for plant conservation. Another garden type that has been established over the past 100 years is the sanctuary garden. These gardens have led the way in genetic protection of threatened species, as well as *ex situ* protection of plants of economic and ecological importance. Many plant species are now being propagated in gardens that no longer exist in the wild. It is clear that the evolution of botanical gardens through the past centuries has now made them flagships of international botanical efforts, serving science and furthermore, our human race in this time of ecological crisis.

## COMPARISON BETWEEN THREE BOTANICAL GARDENS OF THE BALTIC SEA REGION

### Introduction to botanical gardens in the Baltic Region

Botanical gardens are playing an increasingly important role in the Baltic Sea region. Gardens have been and are continuing to be established throughout the region, utilizing their scientific, educational, recreational, conservation, and economic values. Many of the botanical gardens in the Baltic Sea area are newer, having been built largely within the past century or two. Examples of the gardens in this region include the Botanical Gardens of Uppsala University, Sweden; Tartu University, Estonia; Vilnius University, Lithuania; the University of Helsinki, Finland, the University of Wroclaw, Poland; Kaunas Botanical Garden of Vytautas Magnus University, Lithuania; the Latvian Academy of Sciences National Botanical Gardens; and the Botanical Garden of the Polish Academy of Sciences in Powsin. For the purposes of this paper, attention will be turned to the botanical gardens at the Universities of Joensuu and Helsinki in Finland, as well as the Botanical Garden of the Polish Academy of Sciences.

### History

The history of these three botanical gardens is quite different. The botanical garden of the University of Helsinki, Finland is the oldest garden, having been originally established in 1678 in Turku, Finland, but not moved to its present location at Kaisaniemi in Helsinki until 1829. The garden was established by professor Elias Tillandz in what had been the capital of Finland at the time (Turku), and it had to be moved following the burndown of the city in 1827. The oldest and largest part of the greenhouses is the Palm House, built in 1889. During World

**Fig. 2.** Historic Palm House, University of Helsinki garden.
**Fot. 2.** Historyczna palmiarnia ogrodu botanicznego Uniwersytetu w Helsinkach.

War II, the greenhouse collections were lost, excluding one cypress species and some seeds from the Giant Waterlily. Since then, the greenhouses and outdoor gardens of the University of Helsinki have been restored and renovated several times, most recently from 1996 to 1998. The first cataloguing of greenhouse plants took place in 1886–1889, but was conducted again after the war, and the systematic registration of plants began in 1977.

The botanical garden of the University of Joensuu, Finland was first established in 1955. In 1985, it was moved to its current location. This botanical garden is known as "Botania". The third botanical garden, of the Polish Academy of Sciences, was first established in 1970, and then in 1974 it became an independent research unit of the Academy. From that time until 1977, all of the laboratories and collections were located in Skierniewice, about 70 kilometers southwest of Warsaw. From 1977 to 1980, the first new laboratories opened in Powsin, a suburb of Warsaw. At the same time, the first piece of land was bought by the Polish Academy of Sciences for botanical garden displays, collections, and experimental plots. This first piece of land was about 40 hectares, and the first trees and shrubs were planted shortly after the purchase. From 1980 to 1989, other displays and collections were organized on the remainder of the plot. Finally, on May 12th, 1990, the botanical garden opened to the public. During the next five years, new laboratories for biotechnology, molecular biology, and seed biology with a seed bank for natural flora and crop plants were developed. An education center for nature and ecology was opened in 1995, and modern greenhouses have been constructed more recently.

**Size, capacity, collections, staff and fees**

The botanical garden of the University of Helsinki is located very near the center of the city, with its greenhouses and older gardens at Kaisaniemi. There are ten greenhouses in total at Kaisaniemi, covering a surface area of 926 square meters and housing approximately 900 species of plants. Inside these greenhouses are many tropical and subtropical species, mostly from longitudes south of Finland. There are separate rooms for Mediterranean plants, desert plants from various parts of Africa, plants from Madagascar and other islands, as well as species from the African rainforest and so on. There is also a room for tropical wetland plants in the Water Lily House. Outdoors, the gardens at Kaisaniemi include about 2800 plants of different origin, including many tree species, herbs, and more. This outdoor collection is arranged systematically, with the plants that are related to each other through their evolutionary history grouped together. For example, there are separate sections for groups such as birches, lilacs, conifers, and legumes. The University of Helsinki botanical garden has about 15 full-time staff members, with 10 horticultural staffers and five administrators, including Director and Scientific Curator, Leif Schulman. Entry to the outdoor garden is free. To be admitted to the greenhouses, adults must pay 4.20 euros, retired and unemployed 3.20 euros, children (7–17) and students 2.20 euros, and children under 7 years and students of Helsinki University receive free admission.

Located near Lake Pyhaselka and in the city of Joensuu, Finland, the botanical garden of the University of Joensuu, Botania, draws approximately 15,000 visitors per year. Five greenhouses of about 570 square meters hold around 1000 species from five different climate regions from around the world. There are rooms for tropical, subtropical summer-rain, subtropical winter-rain, temperate, and desert climates. There is also a small greenhouse for research and propagation purposes, which is not open to the public. Outdoors, approximately three hec-

tares of land host around 1500 species of plants, including herbs, medicinal plants, decorative plants, vegetables, berries and fruits, poisonous plants, small trees and shrubs, as well as a systematic division. The staff of Botania is minimal, with only several full-time scientists and gardeners employed. The outdoor garden is free to the general public, but admission to the greenhouses incurs a minor fee. Adults must pay 4 euros to enter, groups of ten pay 3.50 euros per person, students and senior citizens 2.5 euros, and schoolchildren from 7–18 years must pay 2 euros to enter.

The botanical garden of the Polish Academy of Sciences in Powsin is the largest of the three botanical gardens compared in this report. This garden is found in the suburban town outside of Powsin, outside the capital city, Warsaw. The indoor greenhouses of the Polish Academy of Sciences cover an area of about 2000 square meters (open to the public), and they house nearly 2000 plant species. In these greenhouses, one can find tropical and subtropical plants, including tropical epiphytic species, tree ferns, and economic plants such as Citrus, Arabian coffee or Chinese tea. Also to be found indoors are camellias, bougainvilleas, fuchsias, and succulent plants. The outdoor gardens at Powsin span a massive area of about 40 hectares, all of which is utilized in some manner. Altogether, the garden has approximately 8600 plant species on display for the public, the majority of which are found outdoors. Important collections include some 580 species of Polish flora, including about 100 endangered species; 2500 taxa of ornamental trees and shrubs such as conifers, evergreen rhododendrons, azaleas, and some rare plants as well; about 2200 species of herbaceous ornamentals displayed as different ornamental gardens for perennials, bulbs with irises, and roses; and around 1220 species of horticultural economic plants such as apple cultivars, vegetables, and medicinal plants. There are approximately 80 people employed at the botanical garden of the Polish Academy of Sciences, including researchers, scientists, gardeners, educators, and administrators. There is a general entry fee to the botanical garden of about 6 Polish zloty (1.46 euros) or 4 zloty (0.97 euros) for students, seniors, and others qualified for reduced price-depending on the season of the visit. The entrance fee to the botanical garden makes up 25 percent of the institution's revenue, and is therefore necessary to maintain the garden's functioning and purpose as a conservation unit. There are about 200,000 visitors to the botanical garden per year.

**Purpose of each botanical garden**

The botanical garden of the University of Helsinki is today a part of the Finnish Museum of Natural History, which is a national natural history collection. The garden lists its specific functions as follows:

1. Maintaining a collection of living plants for use in research and teaching
2. International seed exchange for scientific purposes
3. Botanical research and teaching
4. Public education on plants
5. Coordinating the work of Finnish botanic gardens

All of these functions and values of the botanical garden in Helsinki are based on the scientific plant collection, which has plant accessions of known origin that are thoroughly documented. This collection ultimately serves research, teaching, and educational purposes. Specific research of the University of Helsinki botanical garden includes systematics on the *Musa* section of *Callimusa*; conservation biology with *Saintpaulia*, or wild African violets; boreal flora; and hardiness of new garden plants. Artistic value is expressed by the garden in its presentation of greenhouse and outdoor plant species, as well as the architecture of its old, reconstructed greenhouses-especially the 1889 Palm House.

The University of Joensuu botanical garden explains that although its principal responsibility is to promote research in the fields of biology and forestry as well as benefit education, it offers top level experience and information to the general public both young and old. The garden serves an important role in plant research and conservation through its seed exchange program and work with specific research projects. The botanical garden in Joensuu strives to support teaching and research in various ways, and seeks to make it interesting and exciting for young children and students. In doing so, Botania demonstrates its aesthetic value in creative displays and extra attractions, such as live animals. Work has also been done in cooperation

**Fig. 3.** Leading research, Polish Academy of Sciences' botanical garden.
**Fot. 3.** W ogrodzie botanicznym Polskiej Akademii Nauk prowadzone są badania naukowe o najwyższej jakości.

with the city of Joensuu to acquire seedlings and grow trees for the arboretum of Joensuu.

The botanical garden of the Polish Academy of Sciences was begun primarily as a gene bank for the conservation of native plant species of Poland. Today, the garden has a rather broad level of activity. It conducts research on plants in such areas as botany, plant physiology, biochemistry, genetics, molecular biology, biotechnology, ecology, and horticultural sciences. The garden also serves extremely valuable functions to the public as an institution for popularization of the knowledge about plants, education center and recreation place. Since 1997, the official title of the botanical garden, as determined by the Presidium of the Polish Academy of Sciences, is the Botanical Garden-Centre for Biological Diversity Conservation. It is obvious that this botanical garden is seeking to fulfill the four main values of a garden as described previously in this report. The garden's main areas of research are broken into five departments: the Department for Conservation and Evaluation of Plant Diversity, Department of Plant Biotechnology, Department of Applied Ecology, Department of the Biodiversity Conservation of Upper Silesia, and the Department of Horticultural Collections. Under the direction of Professor Dr. Jerzy Puchalski, these departments carry out a great deal of research. Specific ongoing projects include monitoring and conservation of Polish flora diversity, including endangered plant protection; conserving and evaluating natural flora of Warsaw; studying the resources of natural and ornamental plants in country home gardens; diversity analysis and biosystematics of wild and cultivated plants with the use of molecular markers; and collecting, preserving and evaluating the germplasm of selected crop plants such as *Secale* and *Malus* in order to preserve and protect them for future use. Furthermore, studies are being carried out by the botanical garden of the Polish Academy of Sciences on manipulating plant organisms, using plants for environment pollution studies (growth and development of trees in urban and industrial habitats, and their use as bioindicators of air and soil pollution-metals, $NO_x$, $SO_2$), and on functional and developmental plant anatomy. The garden promotes its artistic and aesthetic value through its public displays and by providing special cultural opportunities at the botanical garden throughout the year.

**Seasonal values and differences**

Most of the countries in the Baltic Sea region, including Finland and even Poland (though to a lesser extent), experience great seasonal variation, with long and cold winters and short summers with great amounts of sunlight. As a result of this seasonal variation, the botanical gardens provide very different opportunities to visitors depending on the time of year. At the garden of the University of Helsinki, the gates to its outdoor garden are open until 8 pm in the summer time, from 1 April to 30 September and the greenhouses are open to the public for seven hours. Furthermore, during most of this 'summer period,' visitors are able to enjoy the outdoor gardens in bloom. At this time, guests can experience the open area of the central garden with ponds and flowers, and can also enjoy the shade of established trees in the outer parts

of the grounds. On the other hand, during the 'winter period' at the Helsinki garden, the garden gates are only open until 5 pm daily, and only the dormant, snow-covered stages of plant life can be seen outside, which has its educational value as well. Inside, one can still experience the escape of the greenhouse environment, but only for five hours daily.

The University of Joensuu's Botania experiences very similar seasonal differences as that of Helsinki University. The winter period of snow cover, however, may typically last longer than in Helsinki and seasonal sunlight experiences larger extremes here. The summertime season at Botania is therefore shorter than Helsinki's, lasting from 1 April to 31 August. During this time, visitors can enjoy the open outdoor gardens for seven hours during the weekdays. The 10th of June is a key date for Botania, as it is used to mark the time when the frost has disappeared. On this date the outdoor plant species are relocated outdoors once again. In summer, water is pumped to the garden's hills from the nearby Lake Pyhaselka, and "alpine brooks" run down the hills into three ponds before returning the water to the lake. This outdoor lakeside setting, complete with man-made brooks and ponds, greatly contributes to the aesthetic and recreational values of the garden in the summertime. In the winter season, while the outdoor garden lies dormant, the indoor greenhouses can still be visited by guests for five to six hours Wednesday to Monday.

For the botanical garden of the Polish Academy of Sciences, the winter does not last as long and is not nearly as severe. Also, the summer lasts longer, although the midsummer days are not as long as in Finland. The botanical garden is open to public visitors for about four hours longer in the summer season than in the winter season. As a very large majority of the plant taxa at this garden is found outdoors, the summer season is a much better time to visit. Furthermore, many outdoor programs are offered at the garden during the summertime, attracting even more visitors and adding to the value of the garden in this season. It is still possible, however, to find special attractions and exhibitions at the garden year-round. For instance, special exhibitions of special flora, fauna, and art are on display throughout the year-even in wintertime.

**Special attractions and differences between the botanical gardens**

Many botanical gardens, including these three from the Baltic Sea region, offer special programs and attractions to entice visitors to enjoy their gardens. Often these attractions are permanent displays that are different from other botanical gardens, setting them apart. These differences and special attractions add to the value of a botanical garden and make each garden unique. Guests are also brought to gardens with the aid of extra programming, such as public cultural events held at the garden facilities. Several examples of these special differences and attractions at each of the three botanical gardens being discussed will be mentioned. At the botanical garden of the University of Helsinki, several permanent displays are used to attract visitors-including young children. This garden takes pride in its large floating aquatic plants of their indoor Water Lily House. Many of the botanical garden's publications include information about the giant water lily, *Victoria cruziana*, which has leaves growing up to two meters and capable of supporting the weight of a full-grown person. Also very special to this garden is its large collection of wild African violet species, *Saintpaulia* spp. Another small attraction of the botanical garden at Helsinki University is a gallery found between their large and small greenhouses, which is used to host temporary exhibitions on themes connected to the natural world.

For Botania, the botanical garden of the University of Joensuu, there is one special attraction that is widely promoted to encourage visitors to experience their garden. This attraction is a display of free-flying tropical butterflies. The butterflies can be found flying in the tropical greenhouse of Botania from April to the end of September. The botanical garden receives cocoons from Great Britain on a weekly basis, and the butterflies then emerge in Botania, feeding on fermented fruit in the garden. This university garden also boasts several red-eared terrapins as well as a talking gold-crested cockatoo as special attractions-especially for younger children to enjoy.

One of the special differences of the botanical garden of the Polish Academy of Science is simply its great size compared to those gardens of the Universities of Helsinki and Joensuu.

**Fig. 4.** Free-flying butterflies, U. of Joensuu botanical garden.
**Fot. 4.** Swobodnie latające motyle w ogrodzie botanicznym Uniwersytetu w Joensuu.

This garden also attracts visitors with special programming, such as cultural events, throughout the year. For almost ten years, the Polish Academy of Science botanical garden has hosted the International Piano Festival Musical Floralia-Music in Flowers. This event lasts for the entire summer, starting in May and ending at the beginning of September. The popularity of the event has grown over the years, with thousands of visitors now coming to the monthly recitals of internationally renowned pianists. The festival is dedicated to the beauty of the garden's variety of flower species, and it is used by the botanical garden to draw guests who may not otherwise make the trip to the garden. All of these types of special attractions and events make each of these three botanical gardens unique and different from one another, and help to attract more guests. Ultimately, the aim is to encourage and spread knowledge of the plant kingdom and its importance in society with the public.

## CONCLUSIONS

The three botanical gardens discussed above, those of the Universities of Helsinki and Joensuu in Finland, and also of the Polish Academy of Sciences, play an important role in our high-speed society. They each offer guests an escape from everyday life and an opportunity to gain knowledge about the amazing variety of plant species in our world. Visitors can discover plants from all regions of the world at each of these gardens as they engross themselves in worlds they may otherwise never experience and can looking for the buaty and feeling of paradise (Sterns 2002; Valauskas 2005). Each of these three botanical gardens is unique, offering different attractions and special events for their guests and making learning exciting. From the Giant Waterlilies of the garden at the University of Helsinki, to Botania's free-flying butterflies and the Polish Academy of Science's piano festival, visitors are drawn year-round and enco-

**Fig. 5.** Attracting all ages, the Water Lily Room from the botanical garden of the University of Helsinki.
**Fot. 5.** Salon roślin wodnych ogrodu botanicznego Uniwersytetu w Helsinkach stanowi atrakcję dla wszystkich zwiedzających bez względu na wiek.

uraged to become informed about the wonderfully diverse plant kingdom. The botanical gardens have different purposes and aims for their work, but each one conducts ongoing scientific research, as well as promotes educational, recreational, and artistic values for all to enjoy. Furthermore, they each play an integral role in the conservation of plant species, an effort that is necessary in our ecologically troubled world. The botanical garden of the Polish Academy of Sciences is by far the largest of these three gardens in terms of overall size and capacity for its outdoor and indoor displays; however, it is also the youngest garden, having only been founded in 1974. As these three Baltic region gardens continue to expand their plant collections through international efforts and attract visitors with new and exciting programs, botanical science will likewise grow in popularity and significance in our modern society.

Botanic Garden Conservation International states that through the maintenance of a wide range of species both within and beyond the garden, research, horticulture, and education programs, botanic gardens are playing an important part in biodiversity conservation and sustainable living. Botanical gardens are indeed playing an increasingly important role in our society, as the need for protection of plant species and biodiversity grows. Environmental degradation on a multitude of levels, as well as overexploitation of certain plants for economic purposes, is contributing to this growing need for conservation. Furthermore, in order to steer our society towards this type of plant protection endeavor, it is necessary to increase awareness and the desire to work towards this goal. Botanical gardens can fulfill both needs. They are havens for plant protection and conservation as well as arenas for botanical, and ultimately

environmental, education. Today, there are about 2000 botanical gardens in 148 countries worldwide, maintaining more than four million living plant collections. In these collections can be found representatives from more than 80000 species-less than one-third of the known vascular plants in the world. With our rapidly growing population causing such effects as deforestation, habitat loss, the spread of invasive species, and agricultural expansion, we are in danger of losing as much as two-thirds of the world's plant species during the 21st century. In the tropics, where most of the plant kingdom's biodiversity is found, deforestation may cause the loss of thousands of plant species in even as short a period as the next few decades. In fact, a number of plant species only exist in greenhouses now, lost forever from their tropical origins.

Many botanical gardens today are striving to promote general environmental awareness and the need of plant conservation for sustainability by making their gardens relevant in today's society. Often located in urban settings, botanical gardens are able to intermingle art, culture and education, creating an exciting and interesting environment for the dissemination of knowledge. Queens Botanical Garden in New York City, USA, provides an example of such an endeavor. This historic garden, located in the heart of one of New York City's largest boroughs, serves the most ethnically diverse county in the United States, and is committed to presenting collections, education and research initiatives and programs that demonstrate environmental stewardship, promote sustainability and celebrate the rich cultural connections between people and plants. It is through such missions that botanical gardens contribute to a sustainable future on the earth. Gardens are not just focusing on collections of rare and unusual species like they once did, but instead are including many of their 'ecological associates' for conservation. Scientists are realizing that still very little is known about the diversity and richness of the plant kingdom, and further, how much effort is needed in order to conserve that diversity. The United Nations has realized this need as well. In the Convention on Biological Diversity from the Rio Conference in 1992, the significance of botanical gardens in plant conservation was directly recognized.

As society moves into the future at light-speed, we will continue to seek solace outside of the busy world, whether it is in botanical gardens or outside in nature, where plants are in their feral environment. We know we are not alone in needing to fulfill a desire to return to our original human habitat-amongst the primitive and untamed natural world. As the world's human population continues to put pressure on the earth's environment, it is evermore important to protect it and work towards sustainable use of environmental resources. Botanical gardens-even in the Baltic Sea region-are important institutions playing a significant role in this necessary conservation and sustainable use of the earth's resources. Practically all life on Earth depends on plants. Humans, in particular, rely on plants for a countless number of uses including food, cattle feed, shelter, clothing, and medicine. Botanical gardens can help to determine appropriate management needed for the earth's plant resources and to develop sustainable methods for subsistence and provide facilities for recreation (Garrod et al. 1993; Maunder 1994). Our Globe needs botanical gardens also in the future.

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