Gardens, Botanical

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Abstract

A botanical garden (BG), also called botanic garden, is an institution and a piece of land marked off for the cultivation of a systematically ordered collection of living plants. It serves purposes of scientific research, conservation, display, enjoyment, and education. Gardens dedicated specifically to the study of plants go back to antiquity. Nevertheless, the emergence of the BG type as an institution is a Renaissance phenomenon closely linked to the gradual development of the science of botany into a discipline independent from medicine. First BGs as such were founded in association with medical schools of European universities in the sixteenth century. Professors of medicine and apothecaries were the proto-botanists of that time, i.e., specialists of medicinal plants. Being rooted in the humanist culture of the Renaissance demanded new forms of investigating nature and teaching knowledge on plants with the result that gardens increasingly began to serve as additional open-air studies. There species could be directly observed and compared respectively to traditional codified knowledge. A growing number of herb books, collections of plant illustrations, and the invention of the herbarium in form of a collection of dried plants accompany this development and reflect the growing range of specimens cultivated in BG. The scientific approach in ordering these living, dried, and illustrated botanical collections had great impact on the history of botany. It led to a change of interest in plants, studied no longer exclusively for their healing properties but as an independent subject matter. Europe’s colonial history bringing more and more new species to the attention of pioneering botanists is another decisive factor for this change. In the seventeenth century, the main interest shifted definitely from medicinal plants to new exotic plant imports. These came first in form of diplomatic gifts from distant empires or as trophies from the European colonies. Parts of princely gardens also displaying botanical collections had often been among the first to display such novelties. Early botanists maintained extensive networks for the exchange of plants to amplify their collections. Along with the increasing success in cultivating foreign species in European climates masses of new material entered BG via laborious collecting expeditions.

Origins

The precursor of the botanical garden (BG) is the medieval medicinal garden, called herb garden or physic garden or garden of simples. “Simples” was used as another word for herbs in medieval
and early modern times because herbs constituted the simplest ingredients of medicinal compositions (*remedieae compositae*) mixed by apothecaries and physicians. In the Middle Ages, monasteries contained gardens with collections of medicinal herbs and preserved ancient botanical knowledge. Since the fourteenth century, also universities kept such gardens for the use of pharmacists. Herbal manuscripts of antiquity were the most influential reference works on botanical questions. Besides the writings of the Greek physician Galen (second century AD), the *De Materia Medica* of the Roman physician Dioscorides (first century AD), a description of physical and remedial properties of plants written in Greek, remained the most authoritative book on botany until the seventeenth century. Although the monastic orders in Medieval Europe mainly perpetuated Dioscorides-based knowledge, a change of value in reference to plants and a desire for their observation becomes palpable in the thirteenth century, e.g., with regard to the writings of the Dominican friar and natural philosopher Albertus Magnus (1193/1206–1280). In particular, Arabic physicians made progress in botanic matters. The Andalusian Ibn al-Baytar, (1179–1248) e.g., based his writings on *Materia Medica* not only on Dioscorides and Galen but also on his personal observations of ca. 1,400 plants. Furthermore, Andalusian (Muslim) Spain had ever since been a forerunner in experimenting with the cultivation of exotic plants. When Christian Spain finally reconquered al-Andalus toward the end of the fifteenth century its gardens became famous and better known among the growing number of villa enthusiasts. This may have influenced the gardens and gardening of these humanists in various ways. A renewal of horticulture had followed Pietro de Crescenzi’s (~1230/35–1320) pivotal treatise on agriculture, the *Liber Ruralium Commodorum* (1304–1309), and intensified during the revival of ancient villa culture based on literary knowledge of antiquity in the fifteenth century. The central stage of this movement and cradle of the first BG was the Apennine Peninsula. Gardens of simples were often included within (Italian) Renaissance villa gardens. Princes, physicians, and pharmacists alike became ardent collectors of traditional herbs and new foreign plants in the sixteenth century. In the early founding period of BG, when medicine, pharmacy, and botany were not distinct disciplines yet, there is no clear notional distinction between evolving types of gardens. Thus, BGs were labeled by various names, among others hortus medicus, hortus botanicus, or hortus academicus.

**Early Examples**

The first BGs were those established in Padua and in Pisa in the early 1540s. Plant identification had then become a pending problem due to conflicting opinions on translating Dioscorides and finding the matching species. At the University of Padua, Francesco Bonafede (1447–1558) had instituted a chair of simples (*lectura simplicium*) in 1533. At the end of the year 1543, he pleaded for the establishment of an associated garden. The Venetian republic supported the proposal, and the desired didactic garden of simples arose in 1545. From then on direct observation of living plants (*ostensio simplicium*) complemented the botanical lessons. Soon exotic species also entered the garden thanks to the Venetian trade relations with the Eastern Mediterranean, and Padua became an important center for the study of botany. The engraver Girolamo Porro published the first guidebook to this BG for the use of students in 1591 (L’Horto dei semplici di Padova, including a ground plan, Fig. 1). In Pisa, the Medici princes patronized the development of botanical studies. In 1543, Grand Duke Cosimo I de’ Medici (1519–1574) invited Luca Ghini (1490–1556), a naturalist, herbalist, and physician from Bologna, to give lectures on simples in Pisa since 1544. Ghini also chose plantings for another BG that Cosimo I instituted in Florence in 1545. His pupil Andrea Cesalpino (1525–1603) succeeded him in Pisa relocating the BG to the east of town in 1563, but the site proved unsuitable as well. Ferdinand I entrusted Lorenzo
Mazzanga, probably a pupil of Cesalpino, and then the Fleming Joseph Goedenhuize (1535–1595), alias Giuseppe Casabona, to create the third and remaining BG next to Pisa’s baptistery from 1591 to 1595. Michelangelo Tilli, director of the BG of Pisa since 1683, published an extensive catalogue on the plants cultivated there in 1723 (Catalogus plantarum horti Pisani, including a map of the garden, Fig. 2).

In the later sixteenth century and first half of the seventeenth century followed important new establishments of BG in Bologna, Leiden, Leipzig, Heidelberg, Basel, Montpellier, Oxford, and Paris. In Bologna, Ghini had already wanted to institute a BG. One of his pupils, the influential natural scientist and philosopher Ulisse Aldrovandi (1522–1605), finally realized this idea in 1568. The curators of Leiden University founded the oldest BG in the Netherlands, the Hortus Academicus Lugduno-Batavus. Charles de l’Écluse, called Carolus Clusius (1526–1609), the leading botanist of his generation, became its scientific director. Arriving in 1593, he set up the BG of Leiden with the help of Dirck Outgaertsz. Cluyt (1546–1598), its first gardener. Clusius maintained one of the biggest networks for plant exchange and brought with him a large tulip collection becoming the base of the tulip trade in the Netherlands. A first catalogue of this BG appeared as early as 1601 under the direction of the physician and botanist Peter Pauw (1564–1617) heading the management together with Bontius since 1598 (Hortus Publicus Academiae Lugduno-Batavie, including a map of the garden, Fig. 3). German humanist centers had become, after Gutenberg’s invention of printing around 1455, important places for the diffusion of early illustrated botanical treatises like Konrad von Megenburg’s Puch der Natur (Augsburg, 1475), the Hortus Sanitatis (Mayence, 1491), or Otto Brunfels’ Herbarium vives eicones (Strasburg, 1536). BGs comparable to the Italian models,
however, came into being only in the later sixteenth century. In Leipzig, Moritz of Saxony (1521–1553) reassigned a secularized monastery garden to the university for didactic purposes as early as 1543, but a proper BG was probably only installed when the mathematician Moritz Steinmetz became the first lecturer of botany in 1580. The University of Heidelberg obtained its first BG thanks to the professor of medicine Henrich Smet (1535/37–1614) in 1593. The eminent physician and natural scientist Conrad Gesner (1516–1565) created a hortus medicus in his hometown Zürich in 1556, not continued after his death though. The earliest BG of Switzerland became then the one instituted by Gaspar Bauhin (1560–1624) at the University of Basel in 1589. France’s oldest BG is the one in Montpellier. Well-known naturalists like Clusius and Lobelius (Matthias de l’Obel) had studied at the University of Montpellier under the popular teacher Guillaume Rondelet (1507–1566) who had a special interest in botany and zoology. A BG following the model of Padua came into being only in 1593 under the surveillance of Pierre Richer de Belleval (1564–1632), professor of botany and anatomy. It inspired the Jardin du Roi (later called Jardin des Plantes) in Paris. Guy de la Brosse, botanist and physician to King Louis XIII, achieved to found the latter in 1626; it did not open to the public before 1640 though. The royal herbalist Jean Robin (1550–1629) had designed an earlier BG on the Île de la Cité for the faculty of medicine in 1597. In England, Henry Danvers (1573–1643), later Earl of Danby, patronized the construction of the first BG for the University of Oxford. Founded in 1621, its first prefect became the German botanist Jacob Bobart (1599–1680).

Ordering Structures

Renaissance gardens, especially in the sixteenth century, generally constitute an intricate interplay between art, science, and nature, a complex conceptual system often combining various functions or even types of gardens in metastructures (e.g., villas). In contrast to pleasure gardens or kitchen gardens, the main function of the BG was the study of botany. Therefore, practical and scientific aspects prevailed in designing this type of garden. The basic form used in the Renaissance for BG is that of the quadripartite quadrangle: The space divides into four sectors by two main paths crossing each other. Familiar models of this basic structure are the medieval cloister garden or also ancient Roman military camps and cities. In addition, the idea of the chahar bagh, the “four garden” form in Islamic culture, may have been another factor for adopting the quadripartite quadrangle in the Renaissance BG. Smaller planting units subdivided each sector of the basic square. Margins (of stone or wood) had to surround the compartments because the species needed clear
separation. The partitioning of planting beds should rationally display the classification of botanical species so that the students could investigate inherent similarities and differences. In use were simple rectangular beds, e.g., at the BG of Leiden (Figs. 3 and 4), but also complex geometrical patterns, e.g., at the BG of Padua and Pisa (Figs. 1 and 2). Simple rectangular beds had already structured the medieval herb garden as documented in the monastery plan of St. Gall (ninth century). Geometric patterns for flowerbeds appear first in illustrations of Francesco Colonna’s *Hypnerotomachia Poliphili* (1499) and in Sebastiano Serlio’s books on architecture (1537); Islamic sources may have inspired them as well. The design of Padua’s BG, devised by the Venetian humanist and architectural connoisseur Daniele Barbaro (1513–1570), was an influential role model. Its unique feature is the circular shape of its surrounding wall, putting the usual quadripartite quadrangle within. Handbooks on designs of planting compartments became soon common. When Goedenhuize became director of the third BG in Pisa he used, e.g., such a handbook for the layout of geometrical patterns for the eight squares of his garden (*Libro di compartimenti di giardini di Giuseppe Benincasa*, ms. 464, University Library of Pisa). Circular or octagonal fountains, often situated in the center of a main square, facilitated irrigation.

In addition to the functional aspects, these layouts transported also symbolic significance illustrating the analogical connection of the four elements, the planetary constellations, and the temperaments of the human body. The encyclopedic collecting activity of botanists also stands in the salvific context of naming and classifying God’s creation in an attempt to repatriate paradise. In terms of plant classification, early botanists experimented with various possibilities before the binominal nomenclature of Carl Linné (mid-eighteenth century) asserted itself. The associated *herbaria* of BG were important scientific instruments for comparing the affinities and
differences of species and thus establishing order in the plant world. Cesalpino as well as the Bauhin brothers, e.g., made innovative contributions in that respect. Cesalpino stopped grouping plants according to their healing properties and focused on their seeds and fruits instead. Gaspard Bauhin listed 6,000 plants in his *Pinax theatric botanici* (1623) and classified them in genera and species. Printed plant catalogues for the orientation of students document the didactic display of order in the living collections, giving a list of species and their exact location in the garden (e.g., in Leiden). In the BG of Padua, the geographical origin of species seems to have played a role for their display (according to Girolamo Porro’s description of 1591).

Vital parts of the structure of early modern BG were also cabinets of curiosities, the precursors of natural history museums. Pisa had a “galleria” with a large natural history collection that attracted many tourists. It displayed cabinets ordered after the proposals of the German physician Samuel Quiccheberg (1529–1567), who wrote the first treatise on museology (*Inscriptiones vel Tituli Theatri Amplissimi*) in 1565 inspired by the ideas of Giulio Camillo Delminio. Glasshouses became common only in the seventeenth century. The first glass house was supposedly that of the BG in Leiden built in 1599–1600. This prototype still comprised the natural history collection and thus functioned as cabinet of curiosities as well.

**Plants**

At the end of the fifteenth century, there were around 1,000 different plant species known and cultivated in European gardens, mostly varieties native to the continent. Some exotic species were familiar through travelogues (e.g., of Marco Polo). Thanks to the progress in navigation and the stabilization of routing, the interest in acclimatizing plants from extra-European expeditions started to grow. Among the first to experiment on acclimatizing exotic plants were rich families like the Medici in Florence who tried to cultivate potatoes, mulberry, and pineapple in their gardens as early as the end of the fifteenth century. However, the early founding phase of BG still classifies as “European” with regard to the history of plant imports. Until the mid-sixteenth century, the plant collections consisted almost exclusively of specimens that were already native in Europe at
that time, medicinal plants in focus. Important was the cultivation and diffusion of Mediterranean species like lily, peony, laurel, oleander, as well as citrus plants. The following period from 1560 to 1620 is characterized “oriental phase” for the enormous amount of plant influx from the Levant. Notably varieties of tulips, narcissi, hyacinths, lilies, and anemones came via the Apennine peninsula to Europe. Imperial ambassadors at the Sublime Porte in Istanbul played a significant role for bringing about the transfer of plant material. Ogier Ghiselin de Busbecq (1522–1592) provided, e.g., the first tulip for the Occident. Imports from South America entered Europe via the botanical gardens of Spain. Of particular historical significance would be economic plants like corn, potato, sunflower, and tobacco. North American plant imports became dominant in the “Canadian phase” after 1620 and were at that time mostly diffused via the Jardin du Roi in Paris. Around the mid-seventeenth century, the development of heating techniques for hibernation architecture would give way to future South African plant imports from the Dutch colonies via the botanical gardens of Leiden and Amsterdam.

Cross-References

- Academies
- Alchemy
- Cosmology
- Delminio, Giulio Camillo
- Elements, Natural
- Galen and Galenism
- Garden, Ethics
- Science
- Scientific Academies
- Studia Humanitatis
- Villas

References

Primary Literature


Secondary Literature
Tongiorgi Tomasi, L. 2005. The origins, function and role of the botanical garden in sixteenth- and seventeenth-