

Hubertus Fischer  
Volker R. Remmert  
Joachim Wolschke-Bulmahn  
Editors

# Gardens, Knowledge and the Sciences in the Early Modern Period



---

## **Trends in the History of Science**

*Trends in the History of Science* is a series devoted to the publication of volumes arising from workshops and conferences in all areas of current research in the history of science, primarily with a focus on the history of mathematics, physics, and their applications. Its aim is to make current developments available to the community as rapidly as possible without compromising quality, and to archive those developments for reference purposes. Proposals for volumes can be submitted using the online book project submission form at our website [www.birkhauser-science.com](http://www.birkhauser-science.com).

More information about this series at <http://www.springer.com/series/11668>

---

Hubertus Fischer • Volker R. Remmert •  
Joachim Wolschke-Bulmahn  
Editors

# Gardens, Knowledge and the Sciences in the Early Modern Period

 Birkhäuser

*Editors*

Hubertus Fischer  
Centre of Garden Art and Landscape  
Architecture  
Leibniz University Hannover  
Hannover, Germany

Volker R. Remmert  
Interdisciplinary Centre for Science and  
Technology Studies (IZWT)  
Wuppertal University  
Wuppertal, Germany

Joachim Wolschke-Bulmahn  
Centre of Garden Art and Landscape  
Architecture  
Leibniz University Hannover  
Hannover, Germany

ISSN 2297-2951

Trends in the History of Science

ISBN 978-3-319-26340-3

DOI 10.1007/978-3-319-26342-7

ISSN 2297-296X (electronic)

ISBN 978-3-319-26342-7 (eBook)

Library of Congress Control Number: 2016940500

© Springer International Publishing Switzerland 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This book is published under the trade name Birkhäuser

The registered company is Springer International Publishing AG Switzerland ([www.birkhauser-science.com](http://www.birkhauser-science.com))

---

# Contents

<b>Introduction</b> . . . . .	1
Hubertus Fischer, Volker R. Remmert, and Joachim Wolschke-Bulmahn	
<b>Part I Scientization and Knowledge About Nature</b>	
<b>The Art of Garden and Landscape Design and the Mathematical Sciences in the Early Modern Period</b> . . . . .	9
Volker R. Remmert	
<b>“Without Design, or Fate, or Force”: Why Couldn’t John Evelyn Complete the <i>Elysium Britannicum</i>?</b> . . . . .	29
Michael Leslie	
<b>The Power of the Sun-King at the Potager du Roi</b> . . . . .	55
Chandra Mukerji	
<b>Part II Mathematical Sciences and the Art of Gardening</b>	
<b>The Organ of the Villa d’Este in Tivoli and the Standards of Pneumatic Engineering in the Renaissance</b> . . . . .	77
Simone M. Kaiser and Matteo Valleriani	
<b>Sundials on the Quirinal: Astronomy and the Early Modern Garden</b> . . .	103
Denis Ribouillault	
<b>Jacques Lemercier’s <i>Scenografia</i> of Montjeu: Architectural Prints, Cartography, and Landscape in 1620</b> . . . . .	135
Anthony Gerbino	
<b>Utopia, Science and Garden Art in the Early Modern Era</b> . . . . .	153
Hubertus Fischer	
<b>Part III Botany Between Art and Science</b>	
<b>Botanical Illustration and the Idea of the Garden in the Sixteenth Century Between Imitation and Imagination</b> . . . . .	183
Alessandro Tosi	

<b>Gardens on Canvas and Paper: Cataloguing Botanical Abundance in Late Medici Tuscany</b> . . . . .	211
Irina Schmiedel	
<b>Reconstructing Order: The Spatial Arrangements of Plants in the Hortus Botanicus of Leiden University in Its First Years</b> . . . . .	235
Gregory Grämiger	
<b>Garden Visits, Observations, Reading and Excerpts: Martin Fogel (1634–1675) and His Techniques of Acquiring Knowledge</b> . . . . .	253
Carola Piepenbring-Thomas	
 <b>Part IV Botanical Knowledge and Horticulture</b>	
<b>Watering the Renaissance Garden: Horticultural Theory and Irrigation Practice in Sixteenth-Century Tuscany</b> . . . . .	269
Anatole Tchikine	
<b>Gardening Nature, Gardening Knowledge: The Parallel Activities of Stabilizing Knowledge and Gardens in the Early Modern Period</b> . . . . .	289
Alette Fleischer	
<b>Gardening Knowledge Through the Circulation of Agricultural Treatises in Portugal From the Sixteenth to Eighteenth Centuries</b> . . . . .	305
Ana Duarte Rodrigues	
<b>Commerce and Erudition: Civic Self-Representation Through Botany and Horticulture in Germany, Sixteenth to Eighteenth Centuries</b> . . . . .	319
Iris Lauterbach	
 <b>Part V Perspective</b>	
<b>Landscape Design and the Natural Sciences in Germany and the United States in the Early Twentieth Century: “Reactionary Modernism”?</b> . . . . .	345
Joachim Wolschke-Bulmahn	
<b>Index</b> . . . . .	367

---

## Introduction

Hubertus Fischer, Volker R. Remmert,  
and Joachim Wolschke-Bulmahn

Whether in the field of medicine, mathematics, botany or architecture: a systematic investigation into the interconnections between knowledge and gardens has yet to be undertaken. Despite numerous case studies, basic analyses are not even available for individual knowledge constellations, for generating and systematising, transferring and applying specific forms of knowledge to horticulture and garden art. The interdisciplinary symposium “Gardening and Knowledge. Landscape Design and the Sciences in the Early Modern Period”, funded by the Volkswagen Foundation, was intended to fill a sensitive gap spanning the sixteenth to eighteenth centuries. It was jointly organised by the Centre of Garden Art and Landscape Architecture (CGL) of the Leibniz Universität Hannover and the Interdisciplinary Centre for Science and Technology Studies (IZTW) of the Bergische Universität Wuppertal. This volume is the result of the symposium held at the Leibniz Universität in September 2012.

The outstanding contributions made by the mathematical sciences and botany to the genesis and development of early modern garden art and garden culture constitute the main focus of the present volume. In comparison, medicine—as the third traditionally important system of knowledge within garden culture—and architecture figure much less importantly here. In accordance with early modern understanding, the mathematical sciences are regarded here in both their ‘pure’

---

H. Fischer • J. Wolschke-Bulmahn  
Centre of Garden Art and Landscape Architecture, Leibniz University Hannover, Herrenhäuser  
Straße 8, 30419 Hannover, Germany  
e-mail: [wolschke-bulmahn@ila.uni-hannover.de](mailto:wolschke-bulmahn@ila.uni-hannover.de)

V.R. Remmert (✉)  
Interdisciplinary Centre for Science and Technology Studies (IZWT), Wuppertal University,  
Gaussstr. 20, 42119 Wuppertal, Germany  
e-mail: [remmert@uni-wuppertal.de](mailto:remmert@uni-wuppertal.de)



forms, such as geometry and arithmetic, and in their ‘mixed’ forms, such as optics, music, gnomonics, astronomy, cartography, architecture, etc. Almost all facets of the mathematical sciences, in this broad conception, are dealt with in the contributions to this volume.

The same is largely true of botany. As a general knowledge of plants, it still embraced those sections, such as plant morphology, plant physiology or plant systematics, which only later developed into disciplines in their own right. While botanical illustration, the rendering of a plant’s form and structure as exactly as possible, represents a kind of early stage of plant morphology, the various attempts at cataloguing and arranging them spatially can be understood as the beginnings of plant systematics. However, both the illustration and the ordering and cataloguing of plants are still in an area located between science and art, between systematic, aesthetic and sociocultural criteria. Thus, one could at the same time speak of a ‘mixed’ botany.

With their many facets, the mathematical sciences and botany point to the increasingly ‘scientific’ approach that was being adopted in garden art and garden culture in the Early Modern period. This approach or process did not, however, happen in an isolated manner; it took place in interaction with philosophical, religious, political and social processes and positions. As this volume forcefully shows, such processes may make use of the knowledge of nature manifested in gardens for various purposes: for princely representation and bourgeois self-representation, for religious symbolisation with moral and propagandist intent, for a philosophically inspired encyclopaedist approach or a political demonstration of power.

The sources from which the contributions are derived include written and pictorial testimonies, but also those that unite text and picture—engraving or drawing. Amongst them are manuscripts and archival material that are presented here or have been specially evaluated for the first time. It should come as no surprise that specialist works and handbooks on horticulture and garden art, on mathematics, perspective, gnomonics and hydraulics are among these or that botanical books, hand-written and printed lists of plants and catalogues, herbaria and florilegia have been drawn upon. While agricultural and architectural treatises look further afield, a diary and personal library point to a special case. Among the written sources, the card index on the one hand and the literary utopia on the other will probably appear to be the most unusual. Among the pictorial sources, the example of scenography will perhaps stand out most obviously, although for aesthetic reasons, the painted pictures of flowers really threaten to steal the show.

The use of the sources is as varied as the sources themselves. Nonetheless, there are principle questions that are addressed in this volume. Among them is the question—or in fact a whole complex of questions—as to how knowledge of nature and technology relating to gardens is generated, handed down, systematised and transferred, as well as being adapted or functionalised. The engineering knowledge of the Renaissance gained from practical experience can certainly prove to be superior to the knowledge codified in ancient texts. On the other hand, the limitations of technological innovations reveal themselves, for example, when

dealing with the irrigation of earlier gardens, since the manifold requirements and tasks in plant cultivation can only be managed by means of laborious manual work and the gardeners' expert knowledge of water, right down to the subtle details.

The degree of complexity in acquiring, collecting and ordering botanical and garden cultural knowledge in individual cases is suggested by the way in which diaries, experiments, book collections, and the knowledge read and noted on index cards are interconnected, as seen in the excerpts and notes from oral sources, letters and newspapers. In contrast, the question as to which garden knowledge was present and available when and in which country, generally points towards the knowledge mostly collected in books in particular areas and regions.

The geographical dimension addressed here includes Portugal, which has hitherto received little attention. Several contributions are devoted to Italy, especially to Tuscan and Roman garden culture, but Great Britain, France, the Netherlands and the large German-speaking areas are also examined. In a way, however, these are 'artificial' boundaries, for trade, travel and correspondence break down such boundaries in particular rhythms, not just within Europe but also further abroad. This is true of the bourgeois garden culture of the Imperial free cities of southern Germany, which not only profit from a lively commercial and scholarly exchange with Italy, but, as the case of the Fugger family in Augsburg shows, also gain access to rare exotic plants and flowers through overseas trade connections. Even more impressive is a Dutch example from the seventeenth century, in which a statesman assembles the flora of the Mediterranean, Turkey, Asia, the Cape of Good Hope, Peru and Suriname in the five acres of his garden.

From the more global aspects and enquiries, the examples mentioned above take us to the volume's actual content. It is divided into four sections and a final chapter leading into the twentieth century. The first section, "Scientization and Knowledge about Nature" embraces an innovative contribution and two examples of studies relating to the principle enquiry into the process of making garden art more scientific in the Early Modern. In the second section, "Mathematical Sciences and the Art of Garden", the 'mixed' mathematical sciences are investigated, whilst in the sections "Botany between Art and Science" and "Botanic Knowledge and Horticulture", botany is examined in its relationship to garden art and garden culture. The question, not easily answered, as to whether the reception of 'modern' scientific theories in landscape architecture in the first decades of the twentieth century actually represents a path to modernity or rather implies a "reactionary modernism", to refer to Jeffrey Herff's work, is addressed in the final chapter.

At the beginning of the process of scientization one finds what is referred to today as the 'Scientific Revolution'. This raises the mathematical sciences to the status of leading sciences ("Leitwissenschaften" according to sociologist Nibert Elias), which are also employed as instruments of power and sources of technological and socio-political knowledge. In the first contribution, Volker R. Remmert sketches out the opportunities this process opened up in early modern garden art for

gaining mastery of and manipulating nature, right down to the transformation of gardens into model sites of political representation. At the same time, he summarises the status of research and, by stating numerous unanswered questions, he formulates areas for which future research is needed. Those consequences which can derive from the possibility of the sciences progressing are detailed by Michael Leslie using the example of John Evelyn's *Elysium Britannicum*. In this case, they lead to a dilemma that cannot be solved and is ultimately responsible for the fact that the *Elysium* remained unfinished. It is the dilemma between Epicureanism and the limitlessness of science on the one hand and the limits that religion, the state and tradition lay down on the other. For a religious man and someone of good birth, this means that science proves to be self-contradictory, for, with its own field of study being limitless, it strives to, or has to, escape the danger of crossing boundaries. On the basis of *potager du roi* in Versailles, Chandra Mukerij explores how the knowledge of nature can become a tool of politics. Her re-reading of Jean de la Quintinie's *Instructions pour les jardins fruitiers et potagers* (1692) discloses the semantics through which knowledge of nature and political power are interlinked and permeate one another. Knowledge of nature can be employed to gain direct control of the land; it can be used to train and develop human energies, skills and duties in the sense of a Christian caring for the soil. But as the study of the powers acting within nature, it can also serve to demonstrate the absolute and compelling power of the sun (and of the Sun King).

The second section steps into the wide field of the various applications of mathematical and technological knowledge in Early Modern garden art. This is first illustrated through Italy. Simone M. Kaiser and Matteo Valleriani turn their attention to the hydraulic organ in the Villa d'Este in Tivoli. With the help of an unpublished contemporary description and meticulous comparisons, they are able to show that the art of engineering in the sixteenth century did indeed turn to ancient texts for inspiration, but in fact represented the result of continuous practical technological improvements rather than the outcome of reinterpreting such texts. In another area of the sciences employed in gardens, that of astronomy and gnomonics, Denis Ribouillault likewise succeeds in correcting traditional views. By revealing the symbolic and moral function of sun dials, citing the examples of those in the papal gardens of Monte Cavallo and the Jesuit gardens of Sant'Andrea Quirinale, he simultaneously puts into perspective the significance of the scientific debates at the end of the sixteenth and beginning of the seventeenth centuries (heliocentrism, Galileo) for the understanding of time and the iconography of Roman garden art of this age. Anthony Gerbino turns to another field when examining Jacques Lemercier's remarkable "scenografia" of the Montjeu castle and garden of the early seventeenth century. This concerns one of the earliest project sketches of a French garden within a seignorial landscape. It is shown how, in this sketch, mapping and surveying in the field, architectural graphics and cartography are fused to produce a new form of architectural representation, a form that had found imitators by no later than the 1650s. This section is concluded with Hubertus Fischer's examination of humanist civic utopias against the backdrop of Renaissance town planning theory. From this theory, he develops the idea of

architecture as a discipline that is formed in the urban space and its gardens. He then investigates the increasingly scientific approach towards utopias and the function of garden culture in utopian towns through the middle of the seventeenth century.

The botanical section of this volume is opened by Alessandro Tosi's analysis of botanical illustrations so important for the sixteenth century. It reveals, on the one hand, the imitation of nature in the sense of a new 'naturalism'—in as exact terms as possible, as demanded by the new scientific spirit—and on the other—linked to this and promoted by it—an imagination which lets botanical illustration in this age vacillate between science and art. A similar direction is followed by the contribution of Irina Schmiedel, albeit with an eye towards a later age and a different object. With the help of the visual and verbal cataloguing of Tuscan flora, for which Cosimo III. Medici commissioned artists and botanists, she explains how beauty and rarity converge with the demonstration of knowledge and wealth. This raises the question of whether "gardens on canvas and paper" have promoted scientific progress in the sense of a taxonomic debate or have, in fact, hindered it. Gregory Grämiger grapples with the problem of plant systematics in the next contribution. He likewise uses catalogues to reconstruct the original arrangement of the plants in the Leyden Hortus Botanicus. It is thereby revealed that very different systems exerted an influence on their arrangement, including those of smell and taste or such as corresponded to the sections of a book on flora. Finally, it could have also simply been their value, a very unbotanical aspect, that determined where they were to be placed. Using the example of the personal library, the card index and the travel diary of Martin Fogel, a Hamburg doctor and scholar of the seventeenth century, Carola Piepenbring-Thomas examines a special case of how and whereby botanical and garden cultural knowledge could be acquired and organised. The reader is offered informative insights into how knowledge is generated by methods and media that supplement and support one another mutually in a complex way.

The second botany section reverts to aspects of the first chapter, but above all extends the field of enquiry and its objects. The first contribution by Anatole Tchikine explores a question that is as central as it is neglected. How was the irrigation of Italian gardens actually carried out from the perspective of plant cultivation in theory and practice? This meticulous source-based analysis produces a 'manuale' of horticultural knowledge: namely, numerous individually adjusted and circumspect methods and techniques of manual horticultural work that cannot be replaced by technological innovations that at the same time have an influence on the shaping of the garden.

The contribution by Alette Fleischer is devoted to the question as to how and by means of which media (herbaria, books, illustrations, lists of plants) 'nature' was converted into mobile, unchanging and combinable (botanical) knowledge, so as to then circulate freely in space and time as accumulated knowledge. These theoretical reflections are underpinned by the examples of the Dutch botanist Jacob Breyne and the developmental process of his botanical books and of the collections of plants in the gardens of Jerome van Beverningh from the second half of the seventeenth century. Ana Duarte Rodrigues is concerned exclusively with the circulation of garden knowledge in Portugal from the sixteenth to eighteenth centuries, using the

literature of agricultural treatises present in the country's most important libraries. She deals less with the knowledge itself than with the tradition of treatises and their translation and circulation in Portugal as witnessed by their external characteristics. Similar investigations in other countries would provide the opportunity to undertake a comparative analysis and a more in-depth study. Iris Lauterbach closes the botanical section with her study of "Trade and Scholarship". This deals with the same period considered in the examination of the treatise circulation in Portugal, but in contrast to some of the earlier contributions, this one looks into civic gardens in Germany rather than at courtly gardens. Often owned by doctors, apothecaries and merchants, these gardens played a significant role in the development of botany and plant cultivation on account of the owners' wide-ranging trade relations and international scholarly exchange. The fact that these gardens formed important elements of urban bourgeois self-representation links them to this era's general culture of representation.

Michael Leslie's reflections on John Evelyn's "Elysium Britannicum" make just as clear as Irina Schmiedel's questions about the visual and verbal plant catalogues commissioned by Cosimo III. Medici that the increasingly 'science-oriented' approach in garden culture is not a process that is free of contradictions. It would require examination of greater depth to establish how developments in 'science' played out in garden art and garden culture. Against this backdrop, it is worth looking at the beginning of the twentieth century, when garden and landscape design in Germany and the United States were becoming intensively aware of more recent developments in the natural sciences, ecology, plant geography and plant sociology. For Joachim Wolschke-Bulmahn, this poses the question of whether one should not also speak, to use Jeffrey Herff's term, of a "reactionary modernism" in garden design in Germany in the early twentieth century. From these provisional findings, one might perhaps draw the conclusion that, in the course of future research into the dynamic connection between "gardens, knowledge and science" one should also investigate more penetratingly the forces of resistance and contradiction.

---

**Part I**

**Scientization and Knowledge About Nature**

---

# The Art of Garden and Landscape Design and the Mathematical Sciences in the Early Modern Period

Volker R. Remmert

---

## Abstract

The mathematical sciences of the early modern period comprised many fields of knowledge, and those such as astronomy, geography, optics, music, practical geometry, acoustics, architecture and arithmetic were often deliberately oriented towards practical applications. Between the mid-sixteenth and mid-eighteenth centuries, practitioners of the mathematical sciences and garden and landscape designers shared the conviction that nature could be controlled and manipulated, and the methods used and the knowledge acquired in the mathematical sciences opened up new ways to do this. These potentialities affected the realm of landscape design and gardening in various formative ways that reached directly into the political sphere by offering new possibilities for political representation, of which there are numerous noteworthy examples, including the gardens of Versailles, perhaps the most magnificent representational gardens in seventeenth-century Europe.

---

## The Mathematical Sciences in Early Modern Europe

In early modern Europe, the term *mathematical sciences* was used to describe those fields of knowledge concerned with measure, number, and weight, reflecting the much quoted passage from the *Wisdom of Solomon* 11, 20: “But thou hast ordered all things in measure and number and weight”. The mathematical sciences consisted of *mathematicae purae*, which dealt with quantities, continuous and discrete as in geometry and arithmetic, and *mathematicae mixtae*, which dealt not

---

This essay draws on my publications (Remmert 2004, 2007, 2008). I am indebted to Ben Kern for his critical reading of the paper.

V.R. Remmert (✉)

Interdisciplinary Centre for Science and Technology Studies (IZWT), Wuppertal University, Gausstr. 20, 42119 Wuppertal, Germany

e-mail: [remmert@uni-wuppertal.de](mailto:remmert@uni-wuppertal.de)