

## DRAUGHTSMEN, BOTANISTS AND NATURE

# *Archimedes*

NEW STUDIES IN THE HISTORY AND PHILOSOPHY OF  
SCIENCE AND TECHNOLOGY

---

VOLUME 15

---

## EDITOR

JED Z. BUCHWALD, *Dreyfuss Professor of History, California Institute of Technology,  
Pasadena, CA, USA.*

## ADVISORY BOARD

HENK BOS, *University of Utrecht*  
MORDECHAI FEINGOLD, *Virginia Polytechnic Institute*  
ALLAN D. FRANKLIN, *University of Colorado at Boulder*  
KOSTAS GAVROGLU, *National Technical University of Athens*  
ANTHONY GRAFTON, *Princeton University*  
PAUL HOYNINGEN-HUENE, *University of Hannover*  
EVELYN FOX KELLER, *MIT*  
TREVOR LEVERE, *University of Toronto*  
JESPER LÜTZEN, *Copenhagen University*  
WILLIAM NEWMAN, *Harvard University*  
JÜRGEN RENN, *Max-Planck-Institut für Wissenschaftsgeschichte*  
ALEX ROLAND, *Duke University*  
ALAN SHAPIRO, *University of Minnesota*  
NANCY SIRAISSI, *Hunter College of the City University of New York*  
NOEL SWERDLOW, *University of Chicago*

*Archimedes* has three fundamental goals; to further the integration of the histories of science and technology with one another: to investigate the technical, social and practical histories of specific developments in science and technology; and finally, where possible and desirable, to bring the histories of science and technology into closer contact with the philosophy of science. To these ends, each volume will have its own theme and title and will be planned by one or more members of the Advisory Board in consultation with the editor. Although the volumes have specific themes, the series itself will not be limited to one or even to a few particular areas. Its subjects include any of the sciences, ranging from biology through physics, all aspects of technology, broadly construed, as well as historically-engaged philosophy of science or technology. Taken as a whole, *Archimedes* will be of interest to historians, philosophers, and scientists, as well as to those in business and industry who seek to understand how science and industry have come to be so strongly linked.

Draughtsmen, Botanists and Nature: The  
Construction of Eighteenth–Century  
Botanical Illustrations

*by*

KÄRIN NICKELSEN

*University of Bern, Switzerland*

 Springer

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN-10 1-4020-4819-X (HB)  
ISBN-13 978-1-4020-4819-7 (HB)  
ISBN-10 1-4020-4820-3 (e-book)  
ISBN-13 978-1-4020-4820-3 (e-book)

---

Published by Springer,  
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

*www.springer.com*

*Printed on acid-free paper*

All Rights Reserved  
© 2006 Springer

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work.

---

## Preface

This book is based on a doctoral thesis submitted to the University of Bern in the summer of 2002. Research on the thesis was made possible through a grant provided by the Swiss National Science Foundation (SNF) from 2000 to 2002 for a project on the history and epistemology of scientific illustrations (Project No. 1152-059499). Gerd Graßhoff headed this programme at the University of Bern and made my reworking of the thesis into a book in English possible. He also provided the funding for the services of a professional copy editor (Margareta Simons, Bern).

The findings presented in this book are closely related to the general results of the SNF project, which are published elsewhere: the source material can be consulted in an earlier monograph and in an electronic edition on the internet;<sup>1</sup> the theoretical approach will be more thoroughly investigated in a textbook on the analysis of scientific illustrations. In addition, this study has made use of theoretical concepts developed by Gerd Graßhoff, which, in their latest form, have yet to be published; these concern primarily the model concept discussed in Chapter 3. The criteria put forward for optimizing scientific illustrations, which are dealt with in Chapter 7, were also originally proposed by Gerd Graßhoff; they were refined and elaborated in the SNF project. Some of the material on the copying links presented in this book was first published in an article in *Studies in History and Philosophy of Science; Part C*;<sup>2</sup> while some of the material in Chapter 5 on the hand-colouring of illustration was published prior to this book in the *Annals of Science*.<sup>3</sup>

I was able to access source material for this study from several archives and institutions.<sup>4</sup> Most of the images that I examined originated from copies held in the University Library Göttingen, while the remaining illustrations came

---

<sup>1</sup> See Nickelsen (2000), Nickelsen & Graßhoff (2001) and Graßhoff et al. (2001).

<sup>2</sup> Nickelsen (2006a).

<sup>3</sup> Nickelsen (2006b).

<sup>4</sup> Bibliographic details for all the illustrations can be found in a table at the end of this book (pp. 273ff.).

from the collections of the Wiesbaden Museum and the University Libraries of Erlangen and Regensburg, whose archives I also used. In addition, I consulted material held in the Archives of the Berlin-Brandenburg Academy of Sciences. I am grateful for the kind support I received from the staff at these institutions and for their permission to quote from the material and reproduce a selection of the images in this book.

A considerable number of people gave practical support or helpful comments on various aspects of my research; I hope I have given them due credit in the appropriate footnotes. However, some contributions were more substantial. First and foremost, I would like to thank Gerd Graßhoff for his personal and scientific advice as well as his steadfast optimism. He devoted far more time to discussing botanical illustrations than would normally be expected of a supervisor and I am deeply indebted to him. Margareta Simons, mentioned above, greatly improved the book through her careful editing; Robert Casties advised me on computing problems; during moments of despair, Hans-Christoph Liess always managed to cheer me up; Julia Meier and Djuke Nickelsen proof-read earlier versions of the book; Katharina Nickelsen took care of my baby son while I inserted the final corrections; and, last not least, greatest thanks of all go to Johannes Sander.

*Kärin Nickelsen*  
Bern, January 2006

---

## Contents

<b>Preface</b> .....	v
<b>1 Introduction</b> .....	1
1.1 The Draughtsman, the Botanist and the Plants .....	2
1.1.1 The Lonely Genius in the Meadow .....	2
1.1.2 Reflections of Nature .....	4
1.1.3 Using the Images .....	11
1.2 The Matter in Question .....	11
1.3 The Course of the Argument .....	14
<b>2 The Making of Botanical Illustrations</b> .....	19
2.1 The Author and his Draughtsmen .....	20
2.1.1 Trew and Ehret .....	20
2.1.2 First Assignments .....	26
2.1.3 The Anatomical Work .....	28
2.1.4 The Instruction of the Draughtsmen .....	32
2.1.5 Nuremberg as <i>Pflanz Schule</i> .....	35
2.2 The <i>Plantae Selectae</i> .....	39
2.2.1 The Project .....	39
2.2.2 The Drawings .....	41
2.2.3 The Engraving .....	48
2.2.4 The Hand-Colouring of the Plates .....	61
2.2.5 Completion and Sale .....	67
2.3 The Art of Botanical Illustrations .....	68
<b>3 The Content of Botanical Illustrations</b> .....	71
3.1 Elements of the Content .....	71
3.1.1 Taxonomically Relevant Properties .....	71
3.1.2 Additional Specific Properties .....	84
3.2 Visualizing Properties of Classes of Objects .....	87
3.3 Possible Interpretations .....	90

3.4	Models of Plant Species	94
3.4.1	Approach	94
3.4.2	Scientific Models	95
3.4.3	Theoretical Background	96
3.4.4	Instances	98
3.4.5	Construction Assumptions	99
3.4.6	Hypotheses	102
<b>4</b>	<b>The Role of Botanical Illustrations</b>	<b>107</b>
4.1	The Audience	107
4.1.1	Private Individuals	107
4.1.2	Learned Societies	108
4.1.3	Academies	114
4.2	Uses	116
4.2.1	Classifying Species	117
4.2.2	Describing Species	126
4.2.3	Observational Evidence	130
4.2.4	A Common Reference Point	132
4.3	Image and Text	137
4.3.1	Information Transmitted	137
4.3.2	Cognitive Effort	143
4.3.3	The Written Word and Visual Language	145
<b>5</b>	<b>Visual Language</b>	<b>149</b>
5.1	The Language of Botanical Illustrations	149
5.1.1	Syntax and Semantics	152
5.1.2	Unwritten Conventions	153
5.1.3	Changes and Continuity	156
5.1.4	Communicability	157
5.1.5	The Technical Language of Pictures	158
5.2	The Question of Colour	161
5.2.1	Standardization	161
5.2.2	The Role of Colour	174
<b>6</b>	<b>Links with Tradition</b>	<b>185</b>
6.1	The Sweet Vernal Grass Visualized	185
6.1.1	Sturm, Leers & Sandberger	185
6.1.2	Thornton, Miller, Curtis & Martyn	188
6.1.3	Schreber, Kerner & Schkuhr	196
6.2	Copying Links	203
6.3	Dissemination of the Practice	215
6.3.1	Overview	215
6.3.2	Patterns	217
6.3.3	General Findings	222
6.4	On the Shoulders of Giants	224



<b>7</b>	<b>The Construction of Botanical Illustrations</b> .....	229
7.1	Modifying the Copied Elements .....	229
7.2	Construction Criteria .....	232
7.2.1	Correctness .....	233
7.2.2	Appropriateness .....	244
7.2.3	Permissibility .....	254
7.2.4	Summary .....	254
7.3	The Purpose of Copying .....	256
7.3.1	Optimizing the Model .....	256
7.3.2	Optimizing the Visual Language .....	258
7.4	The Adequacy of a Botanical Illustration .....	259
7.5	Explaining the Development of Scientific Illustration .....	263
<b>8</b>	<b>Methods and Materials</b> .....	265
8.1	Terms .....	265
8.2	The Period under Examination .....	267
8.3	The Picture Selection .....	268
	<b>List of References of the Picture Selection</b> .....	273
	<b>References</b> .....	277
	<b>Index</b> .....	293