

The Great Naturalists

EDITED BY ROBERT HUXLEY

With 198 illustrations



Thames & Hudson

in association with the

Natural History Museum, London

CONTENTS

'UNITY IN DIVERSITY' 6

THE ANCIENTS 20

Aristotle

THE FIRST PHILOSOPHER-NATURALIST 22
JULIA BRITTAİN

Theophrastus

THE FATHER OF BOTANY 28
CHRISTOPHER J. HUMPHRIES & DAVID SUTTON

Pedanius Dioscorides

RECORDING THE MEDICINAL USE OF PLANTS 32
DAVID SUTTON

Pliny the Elder

COLLECTOR OF KNOWLEDGE 38
DAVID SUTTON

THE RENAISSANCE 44

Leonhart Fuchs

THE VALUE OF ILLUSTRATIONS 48
BRIAN W. OGIŁVIE

Ulisse Aldrovandi

OBSERVATION AT FIRST HAND 59
GIUSEPPE OLMİ

Andrea Cesalpino

PHYSICIAN, PHILOSOPHER AND BOTANIST 63
ROBERT HUXLEY & CHRISTOPHER J. HUMPHRIES

Pierre Belon

PIONEER OF COMPARATIVE ANATOMY 66
ALAN CUTLER

Konrad Gessner

THE BEGINNINGS OF MODERN ZOOLOGY 71
SACHIKO KUSUKAWA

THE ENLIGHTENMENT 76

Nicolaus Steno

UNLOCKING THE EARTH'S GEOLOGICAL PAST 86
ALAN CUTLER

John Ray

THE ENGLISH ARISTOTLE 92
ROBERT HUXLEY

Half-title: Detail from Konrad Gessner's History of Animals.
Title page: Painting of a dandelion and stages in the
metamorphosis of a moth, by Maria Sibylla Merian.
Endpapers: Pages from the journal of William Bartram.

Any copy of this book issued by the publisher as a paperback is sold subject to the condition that it shall not by way of trade or otherwise be lent, resold, hired out or otherwise circulated without the publisher's prior consent in any form of binding or cover other than that in which it is published and without a similar condition including these words being imposed on a subsequent purchaser.

First published in the United Kingdom in 2007 by
Thames & Hudson Ltd, 181A High Holborn,
London WC1V 7QX

www.thamesandhudson.com

© 2007 The Natural History Museum, London
Layout © 2007 Thames & Hudson Ltd, London

All Rights Reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording or any other information storage and retrieval system, without prior permission in writing from the publisher.

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from
the British Library

ISBN 978-0-500-25139-3

Printed and bound in China by C&C Offset Printing Co., Ltd.

Leonhart Fuchs

THE VALUE OF ILLUSTRATIONS

(1501–1566)

I do not need to expound at length the pleasure and delight that the knowledge of plants brings, since there is no one who does not know that there is nothing in life more pleasant and delightful than to wander through the woods, and over mountains and meadows, garlanded and adorned with these varied, exquisite blossoms and herbs, and to gaze at them with keen eyes. The pleasure and delight is increased not a little if an understanding of their usefulness and powers is added. For there is as much pleasure and enjoyment in learning as in looking.

Leonhart Fuchs, Notable Commentaries on the History of Plants, 1542

LEONHART FUCHS TRAINED AS A DOCTOR and wrote over 50 books, mostly on medicine. His most important work of natural history, *Notable Commentaries on the History of Plants* (*De Historia Stirpium Commentarii Insignes*), published in 1542, was also a medical text – in it, Fuchs described plants, discussed their medicinal virtues according to the Classical tradition and indicated the diseases they could cure. However, by paying close attention to plant morphology and by including in his book some plants with no known medicinal value, Fuchs contributed to establishing botany as an independent discipline.

Born into a comfortable bourgeois family in the Bavarian town of Wemding, Fuchs earned a bachelor of arts degree from the University of Erfurt when he was 16. After a year as a schoolmaster, he went to the University of Ingolstadt, where he was made master of arts in 1521 and doctor of medicine in 1524. He held a few short positions as a university lecturer and court physician before joining the faculty of the Lutheran University of Tübingen in 1535, where he remained for the rest of his life.

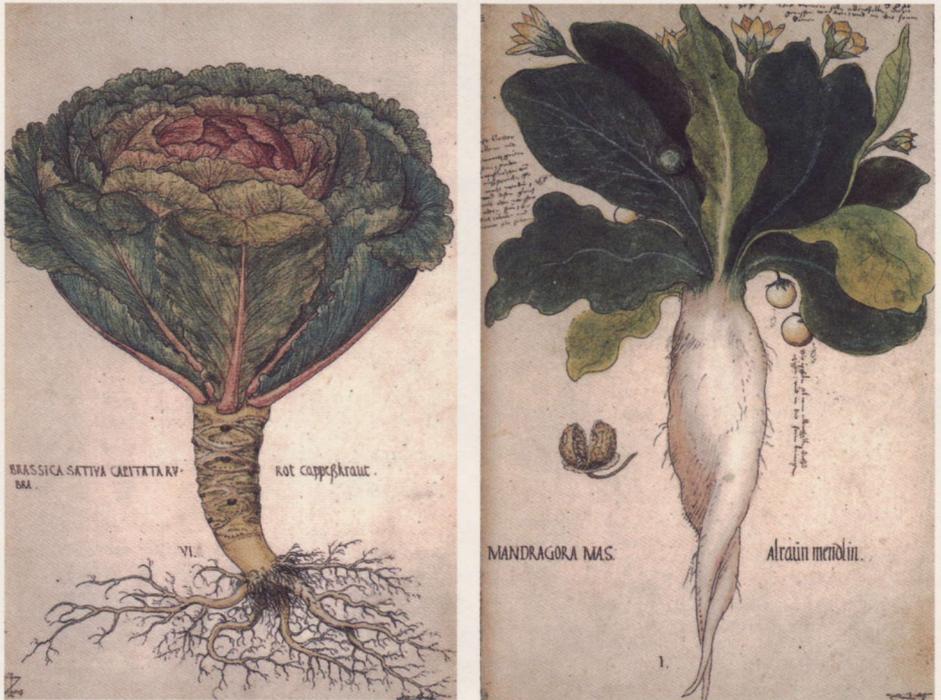
*In Renaissance medicine, no sharp line separated food from simple medicines. Fuchs writes that the shoots of asparagus (in Latin *Asparagus officinalis*; 'Spargen' in German), boiled in broth and dressed with salt, vinegar and oil, are considered a delicacy. According to Dioscorides, cooked shoots calm the stomach and promote urination; Simeon Seth adds that they are the most nutritious vegetable and can be considered intermediate between plant and animal in their nature.*



ASPARAGVS

Asperges.

Spargen.



*These illustrations from the Vienna Codex, Fuchs's unpublished second edition of the Notable Commentaries, show the subtle detail of his artists' original drawings. The drawing of the mandrake (*Mandragora officinarum*; RIGHT) was the basis for the woodcut in the Notable Commentaries; the red cabbage (*Brassica oleracea* var. *capitata*; LEFT) was an addition. In his text, Fuchs warns his readers against counterfeit mandrake roots sculpted into human form (see also the illustration on p. 35).*

In Tübingen, as one of two professors of medicine, Fuchs taught theory, anatomy and medical botany.

Fuchs's approach to botany was inspired by a reform movement originating in northern Italy at this time. Niccolò Leonicensi, a professor at the University of Ferrara, was convinced that the names used by ancient medical writers for plants were not the same as those used by modern apothecaries. To put medical botany on the right footing, Leonicensi compared ancient texts with actual plants. His goal was to establish exactly which plant the ancients meant by each name. Then, doctors and apothecaries could use ancient medical recipes correctly.

Some of Leonicensi's German students then adopted this project as their own. Euricius Cordus wrote a short dialogue, *Botanologicon* (1534), describing an excursion into the German woods to hunt for plants in order to compare them with ancient

texts. Fuchs knew Cordus from his student days at Erfurt, and he too was convinced that medical botany needed reform. His first medical publication, in 1530, on the errors of modern physicians, included an incisive critique of botanical mistakes, based on Leoniceno's method. His *Notable Commentaries* were intended to provide a definitive guide to plant names, descriptions and medicinal uses.

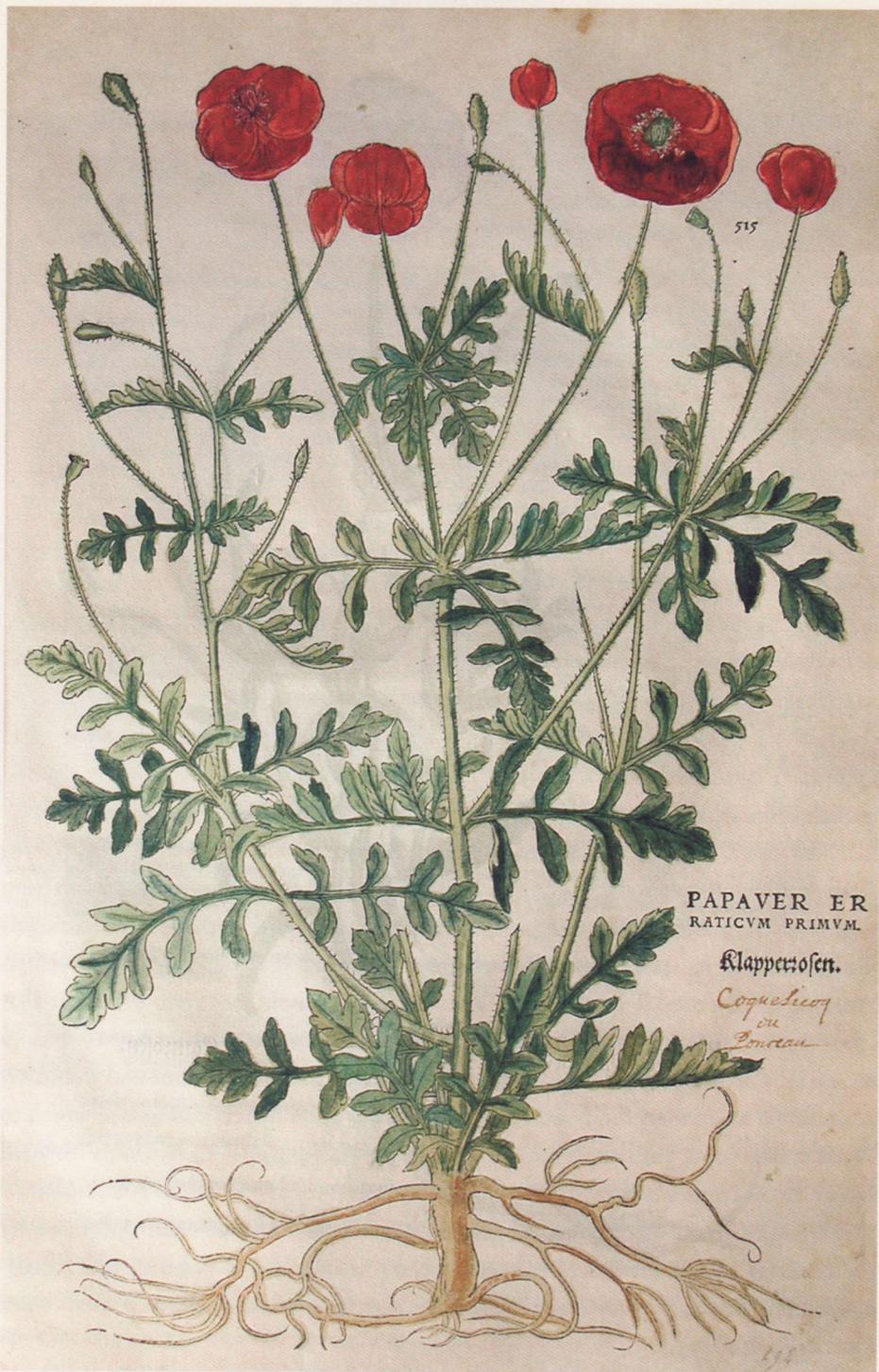
Fuchs was not alone in this aim. In Germany, he was preceded by his contemporaries Otto Brunfels and Hieronymus Bock – the three of them have been called, with some justification, the 'German Fathers of Botany'. Each emphasized a different aspect of botanical research, and it was Fuchs's work that, more than the others, shaped the later course of Renaissance botany.

ACCURATE ILLUSTRATIONS

The invention of printing in the mid-15th century revolutionized natural history illustrations. In Classical antiquity and the Middle Ages, every drawing of a plant or animal was unique. Each time a drawing was copied, it lost some of its original detail, becoming increasingly stylized. The woodcut, also invented in the 15th century, offered the possibility of making exactly reproducible copies of drawings. But naturalists were slow to pick up on its potential. Woodcuts of plants in early printed herbals imitated the crude, stylized pictures found in late medieval manuscripts.

The potential of the woodcut was finally realized in 1530. Brunfels, in his *Living Images of Plants* (*Herbarum Vivae Eicones*, 1530–32), placed short descriptions taken from ancient texts next to woodcuts by Hans Weiditz, a pupil of Albrecht Dürer. Weiditz's illustrations were stunningly different from anything that had been seen before. Working from original specimens, Weiditz produced bold, accurate drawings that could be easily transferred to wood blocks, allowing hundreds of identical copies to be made. The book's very title testifies to the effect that both author and publisher expected it to have on their audience. Indeed, the book appears to owe as much to Weiditz and to its publisher, Johann Schott of Strasbourg, as to Brunfels himself, whose earlier publications were on religion and education. Brunfels complained that Weiditz had depicted 'naked plants', those that had not been described by the ancients, whose medicinal properties were unknown. Yet Brunfels was a dedicated naturalist, as Bock testified in the preface to his own book, the *New Herbal* (*New Kreütter Buch*, 1539).

Bock's approach to natural history was diametrically opposed to Brunfels's. He decided not to include illustrations in his herbal at all. Instead, he wrote his own descriptions of plants, based on careful, repeated observations in the field and in his



Corn or field poppy (*Papaver rhoeas*). The bright colours in this woodcut were added by hand after the book was printed – many copies of Fuchs's *Notable Commentaries* were hand-coloured. Although the work was often done by women and children, who could be paid lower wages than men, a hand-coloured book cost many times more than the same one without colouring.

PICTORES OPERIS,
Heinricus Füllmaurer. Albertus Meyer.



SCULPTOR
Veitus Rodolph. Speckle.



Under the title 'Painters of the Work', Fuchs included this portrait of draughtsmen Heinrich Füllmaurer and Albrecht Meyer, and wood carver Veit Rudolf Speckle, at the end of his Notable Commentaries. It was unusual for illustrated Renaissance books to include portraits of the artists, but Fuchs knew that his book would owe much of its success to their talents.

own garden. Only after describing the plant as it appeared to him did he try to work out which ancient description applied to it. Instead of arranging plants alphabetically, as Brunfels had done, Bock organized them into groups based on similarity, though he did not adopt a systematic classification, and he separated 'foreign' plants, those introduced by merchants, from those that were native to Germany.

In the *Notable Commentaries*, Fuchs combined what he saw as the best elements of both Brunfels's and Bock's herbals. Alongside elegant, full-page woodcuts of plants, Fuchs gave their names in several ancient and modern languages, a description of their form, notes on when and where they grew, their temperament (a Renaissance medical concept) and their medicinal virtues according to several ancient authorities. Each part of this task involved innovative choices.

Unlike Bock, Fuchs was convinced that pictures were essential for his book. But Fuchs was not happy with Weiditz's approach either. Weiditz had used the artistic techniques of foreshortening and shadowing to increase the realism of his pictures. And he had depicted torn and wilted leaves, withered flowers and other characteristics of the actual specimen before his eyes. Fuchs thought that would not do. His contemporary, Sebastian Montuus, along with other philosophers, believed that pictures could tell a scholar nothing about the essential nature of a plant; at most, they could depict the peculiarities of individual specimens. Fuchs disagreed, but he saw the danger in Weiditz's approach. To overcome it, Fuchs insisted on carefully supervising the production of his pictures.

Fuchs employed a team of three artists; unusually, the book includes their group portrait at the end. Albrecht Meyer made the original drawings of the plant. Heinrich Füllmaurer copied each drawing on to a wood block, checking it against the plant itself as he worked. Finally, Veit Rudolf Speckle cut away the blank space from the block, leaving the raised surface that, inked and pressed on damp paper, would reproduce the image.

As the artists worked, Fuchs inspected the results. He corrected inaccuracies, but he also amended any part of the drawing that represented a peculiarity of the individual specimen that was not found in other plants of the same species. The result was a drawing that represented what a typical individual of the species might look like, but not necessarily what any individual plant did look like. In some cases, Fuchs showed flowers and fruits on the same plant, even when the two never occurred simultaneously in nature, so that the naturalist equipped with his book could recognize both. Despite the limitations of the medium, Brunfels's and Fuchs's example prevailed over Bock's: most 16th-century botanical books were lavishly illustrated.



In this woodcut Fuchs placed three varieties of cherry in one illustration (*Prunus cerasus* and *P. avium*); the hand-colouring clearly distinguishes between them. The illustration shows the flowers and fruit at the same time, to aid in identifying the plant.



Hemp agrimony (Eupatorium cannabinum): Fuchs had no idea whether the ancients knew this plant, and if so, what they called it. He complained that the pharmacists of his day mistook it for true agrimony. Germans called it St Cunegund's wort.

NAMING THE PLANTS

Fuchs's illustrations were striking, but they would have been useless to medical readers without the text that accompanied them. Following Leoniceno, Brunfels and Bock, Fuchs strove to establish the ancient Greek and Latin names of plants. Renaissance pharmacists often used ancient names for plants that were completely different from what the ancients meant. Such mistakes led to medicines that were weak, ineffective – or worse, harmful. Because Fuchs indicated the medicinal virtues of plants according to Galen, Dioscorides (p. 33) and other ancient sources, he had to ensure that he got the names right.

Fuchs was not always successful at this task. Plant geography was only just beginning to be studied, and he had never travelled beyond Germany. Unlike Euricius Cordus, who had studied in Italy, Fuchs had no first-hand knowledge of the differences between Mediterranean and German floras. Nonetheless, with effort and some luck, he successfully identified many of the plants known to the ancients. Even his failures spurred further research.

He began each chapter of the *Notable Commentaries* with a section on 'names': Greek, ancient Latin, modern Latin and German.

Purple violet, for instance, was 'Ion porphuron to the Greeks, *Viola muraria* or *purpurea* to the Latins, *blau Veiel* or *Merzen violen* to the Germans; the pharmacists just call it *Viola*.' Coltsfoot, on the other hand, was known as '*Tussilago*' in Classical Latin, but '*Ungula caballina*' (literally, 'little horsehoof') to Renaissance pharmacists. Occasionally he included synonyms from other languages.

Fuchs organized his herbal in alphabetical order – according to the first letter of the plant’s Greek name, or its Latin name when it was unknown to the ancients. But he prefixed the descriptions with four indexes of names: Greek, ancient Latin, pharmacists’ Latin and German. That way, readers could go from any of the names to the plant itself. Sometimes, in the case of newly introduced plants with no ancient Greek or Latin name, Fuchs placed them near other, botanically related plants. He based his judgments of affinity on taste and smell, which were clues to a plant’s medicinal virtues.

DESCRIBING PLANTS

Fuchs often referred readers to his pictures for an accurate description of a plant’s form and shape. His verbal descriptions, unlike those of Bock and of Valerius Cordus (Euricius’s son), were brief, sometimes too brief, and often copied from Dioscorides. He contributed to standardizing botanical terminology by providing a list of difficult terms with their definitions. Even though many of Fuchs’s terms are no longer used or have changed their meaning, the list was the first botanical glossary and helped contemporaries settle on names for the different parts of a plant.

Fuchs was more original in describing the places and times where plants grew and flowered, information that was essential for gathering medicinal plants and could also be used to help identify an unknown plant. He also described a plant’s ‘temperament’, its balance of the ancient elemental qualities of hot, cold, moist and dry, that in Galenic medicine gave clues to how a plant would act as a drug. Following its temperament, Fuchs indicated the plant’s actual medical powers by quoting liberally from Dioscorides, Galen, Pliny and occasionally other medical authorities.



Title-page of the Notable Commentaries. The lengthy title emphasizes the exertion and expense that the book cost Fuchs. As a privilege, Emperor Charles V granted an early form of copyright (at the bottom), but the book was soon pirated in France.

In describing plants, Fuchs aimed to reform pharmaceutical botany. Morphology was only a part, and not the most important part, of his descriptions. But through his pictures, and his attempts to distinguish different varieties of the same species, he also contributed to a growing interest in plant morphology in the 1540s and 1550s. Sparked in part by criticism of Fuchs and his contemporaries, this growing interest would lead the next generation of botanists to downplay medicinal botany in favour of the study of morphology and distribution. In this regard, Fuchs's book played an important role in establishing botany as an independent discipline.

AFTER THE *NOTABLE COMMENTARIES*

After the *Notable Commentaries*, Fuchs continued to gather illustrations and descriptions of plants. He and his publisher issued German and French translations of the



Tomato (Solanum lycopersicum): this drawing from the Vienna Codex may be the earliest European illustration of a tomato plant. Despite its errors, it shows how Fuchs continued to seek out, describe and depict new plants.

Commentaries, as well as a volume containing the illustrations with minimal text for the use of students. By 1557, he had prepared two volumes for a new, expanded edition of the *Commentaries*, each with 400 illustrations and more accurate descriptions, and he was at work on a third. But his publisher died and he could not find another willing to take on the risk of publishing an expensive botanical book. At his death in 1566, it remained in manuscript. Fuchs's remarks in his new preface, and in his correspondence, reveal a man jealous of his reputation and suspicious of rivals, unlike the 1542 preface, in which he had been quite generous to his predecessors. He remained in Tübingen, where he continued to teach medicine. In his last three years he suffered from chronic illness. He died a disappointed man, frustrated in his ambition to revise and correct his great work of natural history. But his *Notable Commentaries*, flawed as they were in his own hindsight, marked an epoch in the development of Renaissance natural history.

FURTHER READING

THE ANCIENTS

Aristotle

- Aristotle, *The Complete Works of Aristotle*, edited by J Barnes (Princeton: Princeton University Press, 1984)
- Barnes, Jonathan, *Aristotle: A Very Short Introduction* (Oxford and New York: Oxford University Press, 2000)
- Barnes, Jonathan, Schofield, M. and Sorabji, R., *Articles on Aristotle*, vol. 1 *Science* (London: Duckworth, 1975)
- Gillispie, C. C. (ed.), *Dictionary of Scientific Biography*, vol. 1 (New York: Charles Scribner's Sons, 1970)
- Gothelf, Allan, 'Darwin on Aristotle', *Journal of the History of Biology*, vol. 32, no. 1 (1999), 3–30

Theophrastus

- Sharples, R. W., *Theophrastus of Eresus, Commentary Volume 5: Sources on Biology (Human Physiology, Living Creatures, Botany: Texts 328–435)* (Leiden: Brill, 1994)
- Morton, A. G., *History of Botanical Science* (London: Academic Press, 1981)
- Theophrastus, *Enquiry into Plants*, trans. Sir Arthur Holt (London: W. Heinemann; New York: G. P. Putnam's Sons, 1916)
- Theophrastus, *De Causis Plantarum*, trans. Robert E. Denger (Philadelphia: Westbrook Pub. Co., 1927)

Pedanius Dioscorides

- Brubaker, L., 'The Vienna Dioskorides and Anicia Juliana', in A. Littlewood, H. Maguire and Wolschke-Bulmahn (eds), *Byzantine Garden Culture* (Washington, DC: Dumbarton Oaks Research Library and Collection, 2002)
- Downs, R. B., 'First herbalist: Dioscorides (c. 40–80)' in R. B. Downs (ed.), *Landmarks in Science: Hippocrates to Carson* (Littleton: Libraries Unlimited, 1982), 52–54
- Greene, E. L., *Landmarks of Botanical History* (Stanford: Stanford University Press, 1983), vol. 1, 218–23
- Morton, A. G., *History of Botanical Science* (London: Academic Press, 1981), 70–71
- Riddle, John, *Dioscorides on Pharmacy and Medicine* (Austin: University of Texas Press, 1985)

Pliny the Elder

- Downs, R. B., 'The great compiler: Pliny the Elder: Natural History (23–79)', in R. B. Downs (ed.), *Landmarks in Science: Hippocrates to Carson* (Littleton: Libraries Unlimited, 1982), 48–51

- Morton, A. G., *History of Botanical Science* (London: Academic Press, 1981)
- Green, E. L., *Landmarks of Botanical History* (Stanford: Stanford University Press, 1983), vol. 1, 223–28
- Pliny the Elder, *Natural History*, trans. and introduction by John Healy (London: Penguin, 1991)

THE RENAISSANCE

Leonhart Fuchs

- Arber, Agnes, *Herbals: Their Origin and Evolution; a Chapter in the History of Botany, 1470–1670* (Cambridge: Cambridge University Press, 3rd ed., 1986)
- Greene, E. L., *Landmarks of Botanical History*, edited by Frank N. Egerton (Stanford: Stanford University Press, 1983)
- Kusukawa, Sachiko, 'Leonhart Fuchs on the importance of pictures', *Journal of the History of Ideas* 58 (1997), 403–27
- Meyer, Frederick G., Emmart Trueblood, Emily and Heller, John L., *The Great Herbal of Leonhart Fuchs: De historia stirpium commentarii insignes, 1542 (Notable Commentaries on the History of Plants)* (Stanford: Stanford University Press, 1999)
- Ogilvie, Brian W., *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2006)
- Reeds, Karen M., *Botany in Medieval and Renaissance Universities* (New York and London: Garland Publishing, Inc., 1991)

Ulisse Aldrovandi

- Findlen, P., *Possessing Nature. Museums, Collecting and Scientific Culture in Early Modern Italy* (Berkeley, Los Angeles, London: University of California Press, 1994)
- Il teatro della natura di Ulisse Aldrovandi*, Bologna (Editrice Compositori: Bologna, 2001)
- Olmi, G., 'Science-Honour-Metaphor: Italian Cabinets of the Sixteenth and Seventeenth Centuries', in O. Impey and A. MacGregor (eds), *The Origins of Museums* (Oxford, Clarendon Press, 1985), 5–16
- Olmi, G., *L'inventario del mondo. Catalogazione della natura e luoghi del sapere nella prima età moderna* (Bologna: Il Mulino, 1992)
- Olmi, G. and Tongiorgi Tomasi, L., *De piscibus. La bottega artistica di Ulisse Aldrovandi e l'immagine naturalistica* (Rome: Edizioni dell'Elefante, 1993)