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From Art to Science

Experiencing Nature in the European Garden

1500-1700

edited by
Juliette Ferdinand

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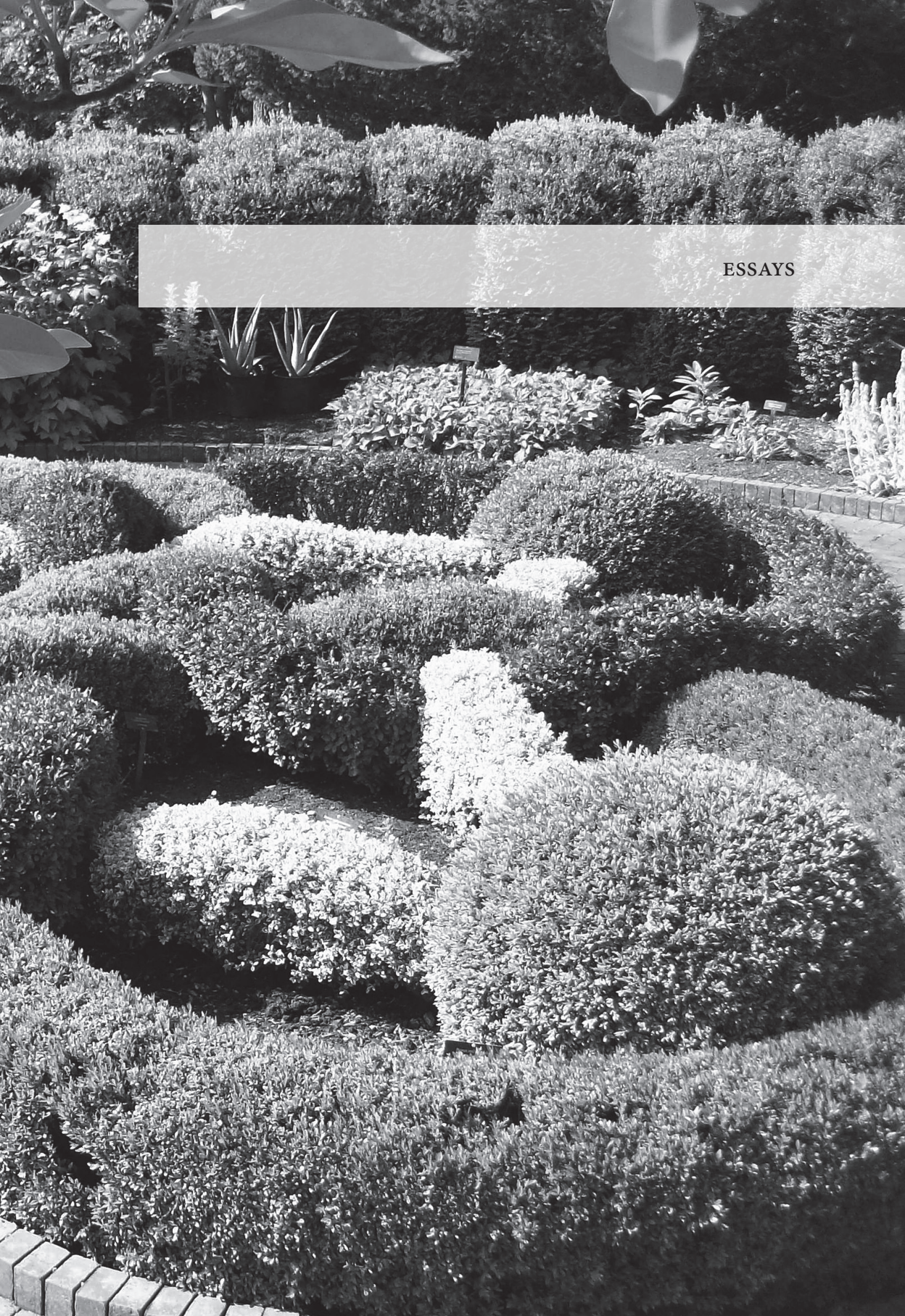
Summary



ESSAYS

Fig. 1. Frontispiece of *Das Kreüterbuch* by Adam Lonitzer, Frankfurt am Main, 1577.

In the "Hortus universalis": science, technique, and delight in gardens

Juliette Ferdinand

> You were the seal of perfection, full of wisdom and perfect in beauty.
> You were in Eden, the garden of God;
> Every precious stone adorned you: carnelian, chrysolite and emerald,
> Topaz, onyx and jasper, lapis lazuli, turquoise and beryl.
> Ezekiel (28, 12-13)

In the legend of the Golden Age as described by Hesiod in his *Works and Days*, as well as in the ideal garden of Eden evoked by the book of *Genesis*, knowledge has an ambiguous status. These two mythic "states of nature" as Rousseau would call them, were degraded by the acquisition of science, whether it be the discovery of technical knowledge in the Greek vision, or the cognition of Good and Evil in the biblical text. In both traditions, nature possesses of a potent knowledge that, used improperly, is the cause of the degradation of mankind and his environment. The art of gardens is nothing but man's attempt to return to that idyllic original state, in order to recover the wisdom he has lost[1]. Actually, in the sixteenth and seventeenth centuries, most gardens were conceived with a precise spiritual purpose in mind, as Jim Bennett and Scott Mandelbrote have ably explained[2]. In their study of biblical metaphors, they showed that for men in Early Modern Europe, the desire to recreate the lost paradise was considered possible "through the restoration of learning" and "could also be achieved by practical measures, such as the establishment of botanical gardens, which reunited plants of the world in a single space, the planting of fruit trees, whose cultivation mimicked the dutiful dressing of the Garden of Eden by its first inhabitants, Adam and Eve"[3].

The connection between gardens and teaching is a persistent *topos* in the Western World: in Ancient Greece, teachers gave their lessons while walking down alleys or under porticoes, where they could read aloud for a small audience of pupils, and discuss philosophical questions, like in the famous Platonic Academy. In the *Mouseion* of Alexandria, an important role was given to gardens, situated next to the great library which was built around a shady courtyard with a *peripatos* frequented by lovers of knowledge[4]. Heirs of Greek culture, the Roman élite often designed the gardens of their villas to be in direct contact with *studi* or libraries, as in the sublime case of Villa Adriana in Tivoli, which included a Latin and a Greek library with a direct entrance into the garden[5].

Quiet, calm and peace that characterize any garden make it a perfect place for meditation and study, but also for the observation of nature. Without any of the natural dangers or obstacles found in the wild, gardens become the very place where men can also be receptive to "nature's teaching". Such is the idea expressed in Erasmus's dialogue *Convivium religiosum,* through the protagonist Eusebius who, talking about his own *hortus*, asserts that nature "teaches the observant man many things if she finds him attentive and receptive"[6]. It is not surprising that a few decades later various figures among the English Empirics continued to praise its qualities: Francis Bacon (1561-1626) himself, one of the greatest figures of the Scientific Revolution, wrote an essay on the subject entitled *Of gardens*[7]. In his introduction, Bacon famously asserted: "God Almighty first planted a garden, and, indeed, it is the purest of human pleasure", and he goes on to describe its qualities: "It is the greatest refreshment to the spirits of man, without which, buildings and palaces are but gross handiworks. And a man shall ever see that when ages grow to civility and elegance, men come to build stately, sooner than to garden finely – as if gardening were the greater perfection. I do hold it, in the royal ordering of gardens, [that] there ought to be gardens, for all the months in the year, in which severally things of beauty may be then in season"[8].

Referring to its divine origin, Bacon affirms not only the virtues of gardening, but the superiority of the garden over architecture, which is quite a rare conception of the hierarchy of the arts at that time. Significantly, Bacon echoes a text published sixty years before, the *Recepte véritable* by Bernard Palissy, who was, like the English scientist, a partisan of practice against theory and a fervent protestant[9]. In his project of a garden, Palissy developed an ideal of rustic art according to which the original state of architecture, with its grottoes and rustic huts, is unquestionably superior to any building made by man, contrary to the Vitruvian myth of architectural progress[10].

Such a paradoxical conception of art, which would tend to recover a natural state, perfectly reflects the fascination of that time for objects situated at the frontier between *naturalia* and *artificialia*, and housed in the *wunderkammer* of all Europe. The profound interaction, or in some cases real fusion, between nature and art could be achieved in gardens thanks to technical and scientific progresses encouraged by the Renaissance élite's tastes. Following the example of Antiquity, from the end of the fifteenth century noblemen began commissioning more and more elaborate gardens for their own urban and suburban dwellings. This growing fashion meant that new professional knowledge was required, which was often generated in the field and stimulated by intense rivalries between powerful patrons. Fountain makers, botanists, craftsmen of every type, architects and artists were involved in "re-creating" nature and selecting only the most fascinating manifestations and dramatizing them. Their realizations were intended to emphasize, transform and make the most of nature's numerous potentials - beauty, strength, multiplicity and spectacular effects. These craftsmen's talent and their experiments are fundamental in the evolution of the art of gardening. While, by and large, they kept to the fashion of their day (as expressed in their patrons' plans and

instructions), they occasionally offered a more personal vision, drawing on their own skills and experience.

Historians first began to be interested in the role of artisans in the acquisition of scientific knowledge in the 1960's; one of the first studies was Paolo Rossi's *I filosofi e le macchine* (1962). Recently, a growing recognition of the importance of practice and experience over theory during Renaissance has inspired a veritable host of publications and conferences enhancing the importance of manual experience and the role played by the Empirics in medicine and natural history[11]. This trend of studies is part of a wider interest in the "low" protagonists of the history of art and sciences, which aims to get a better and more accurate understanding (by studying the context) of how great scientific advances and artistic masterpieces saw the light of day. As alternatives to traditional and academic teaching, practical experts like surgeons, craftsmen and architects possessed a knowledge that was ignored or despised by the learned élite of the time. Their science came mainly from their own manual practice, which gave them a direct and personal experience of nature, whether this involved the human body, plants, animals or geological specimens, or chemical reactions between different materials, as in the case of artists and architects. The 16th and 17th centuries saw a great blossoming of treatises written by these professionals, who aspired to the same respect and consideration as learned professors or even classical authorities. The first theorizing about gardening emerged in this context, not in the form of complete treatises, but as a part of agricultural manuals, wich knew a great flourishing in the sixteenth century[12].

During the Renaissance, technical and naturalistic experiences would occur mostly in three places: inside the artisan's own body – and this is the main subject of Pamela Smith's classical study[13] – in the craftsmen's workshops – which is another fascinating and currently popular object of research –, in hospitals[14] and through the body of the naturalist himself, who described not only the appearance but also the taste of plants[15], and – as the various contributions to this volume will show – in gardens. Every garden was intended to emphasize sensory experiences, in its variety of colours, architectural and vegetal structures, sounds and smells, *scherzi d'acqua* and even automats which surprised and delighted visitors. This sensorial dimension took on greater importance as it evolved from the fifteenth and sixteenth century classical forms to the Baroque seventeenth century which favoured more and more spectacular settings, with no regard to the numerous criticisms that were raised against the lavish expense they involved.

This evolution required efforts of real research for technical progress in various fields. Hydraulics was an essential science for gardeners, fundamental for irrigation, and for the construction of increasingly complex fountains and grottoes. Such artificial caves served as cool places where water flowed from elaborate sprays, but they were also treasure chests where rarities from the underground world and precious stones were displayed, like in a subterranean *wunderkammer*[16]. Philippe Morel studied the link between grottoes and contemporary geological treatises, showing that they were the product of a common spirit of the age, which sought to understand nature and was at the

same time fascinated by it[17]. A knowledge of mechanics was also required for the most elaborate creations where automats entertained visitors and surprised them by playing on their confusion with machines that were apparently alive[18]. Gardens were also the place for naturalistic observation such as the famous case of Jacopo Ligozzi (1547-1627), who lived in front of the Orto botanico in Florence, where he could observe plants directly, which later became the subjects of his beautiful illustrations for Francesco I de' Medici, Grand Duke of Tuscany, from 1577 to 1587[19].

In the central European city of Prague, the celebrated patron of the arts and sciences, Emperor Rudolf II of Habsburg (1552-1612) possessed not only a fantastic collection of *naturalia* and *artificialia*, but also encyclopaedic medicinal gardens within the walls of his castle. Such gardens facilitated botanical and medical studies, and allowed artists like Daniel Fröschl (1565-1613), Hans Hoffmann (1530-1592), Roelandt Savery (1576-1639) or Giuseppe Arcimboldo (1526-1593) to observe natural specimens from life[20]. Zoology too is associated with the development of gardens, whether because patrons had – like Rudolf II – a zoological park where they could admire the rarest and most exotic species, or because they conceived their garden as a park with the passion for hunting in mind, which was the most important entertainment for noblemen.

The following contributions adopt a great diversity of approaches to explore the fusion and emulation between art and science in the semi-natural context of gardens. Most of them were presented during the conference entitled *Nel laboratorio del Rinascimento. Arte e scienza nei giardini europei tra '500 e '600*, which was held in Verona in October 2013. In this volume, different works of art and technical craft are examined, representing the leading gardens of the time: fountains, grottoes, elaborate *parterres*, architectural creations and cultivation of exotic or medicinal plants, that were studied and often depicted in albums or illustrated books. Every case shows how craftsmen and naturalists played an essential role in the layout of the gardens where they worked or which they owned.

These concrete examples give raise to some fundamental questions, like the multiple meanings given to the word "garden", which is worth explaining here. In the 16th century, this term would refer to a "wild nature" and not only, as we might expect nowadays, to an "ordered nature". Luca Ciancio shows for example that the botanist Pietro Andrea Mattioli (1501-1578) associated the word "garden" with a natural environment, which was infinitely superior in his opinion to any garden made by man. Similarly, Florike Egmond reminds us that in the 16th century Monte Baldo near Verona was called "Hortus Italiae" or even "Hortus Europae" because of the variety of flora naturalists could observe there. In this case, the term garden had a very positive meaning as a synonym of a privileged place where it was possible to study a great number of species: but it is paradoxically applied to wild spaces. Nevertheless, many naturalists of the day owned a garden and considered it an indispensable instrument for reading and studying nature. This crucial function is confirmed by the fact that in the second half of the sixteenth century, botanical gardens became an institution linked to universities, a nec-

Fig. 2. Gerbrandt van Eeckhout, *Botanists*, London, British Museum

essary study tool, as in the case of Pisa (1543) and Padua (1545) or the important garden in Leiden, created in 1590, and administered by directed by the great botanist Carolus Clusius (1526–1609) from 1593.

The role of networks of naturalists, collectors, *curieux* and noblemen in the development of gardens is another fundamental point that clearly emerges from these essays. Like certain enigmatic paintings that were conceived to feed erudite discussions more than to represent a well defined subject[21], gardens were the place in which to discuss nature and art, as in Erasmus' *Convivium Religiosum*. Gardens were observed by visitors, they were described in their letters or in books, and served both as a direct and indirect *medium* for the transmission of knowledge[22]. They were at the centre of a very dense epistolary network, which resulted in a dynamic flow of information and greatly contributed to the development of natural history: letters inform us about the way naturalists or *curieux* wrote each other in order to share their knowledge and doubts, to ask for or to offer species[23]. These documents, pertaining to what could be called a real "Republic of Science", are a treasure chest of information about gardens, their technical achievements and botanical settings, whenever they were described by attentive travellers[24]. Without written documents and plastic representations, the gardens of the past

would remain a complete mystery to us today. This surprising but effective link between a living work of art, subject to incessant change, ixed pictures of it, and written works, eternally fixed in time, provided the basis for the study of the Renaissance gardens.

The relationship between *liber* and *hortus* also appears in a metaphorical use of the word "garden": Pietro Andrea Mattioli described his own commentary of Dioscorides' *De materia medica* as "a garden" in the dedication to Cardinal Madruzzo. Another interesting "paper garden" is Paul Contant (1562-1629)'s *Jardin, et Cabinet poétique* (1609), which is the catalogue, in verse, of his cabinet and garden[25]. The son of a pharmacist, Contant was able to feed his passion for plants early in life; later, his collection slowly grew with an enormous quantity of objects of all sorts. In this case, the lively essence of the garden is recreated with poetic formulas, as in the scientific poetry so widespread in France during the sixteenth century, thanks to the successful *La Semaine ou Création du monde* (1581) by Guillaume de Salluste[26]. In the *Jardin et cabinet poétique*, Contant's art, his literary verve, and science, his knowledge of plants, merge in a very singular text aimed at immortalizing his own collection and garden. His poetic catalogue aptly reflects the spirit of the age, when men did not conceive art and science as two separate categories.

Unsurprisingly, in nearly every page of this volume, water is one of the most important topics. Indeed, the most famous craftsman of the Renaissance, Leonardo da Vinci, oriented his whole philosophy and oeuvre on this theme. A little known, and for us, emblematic aspect of his career are projects for two gardens, one for the Governor of Milan, Charles d'Amboise and the other for the Castle of Romorantin, which is the central topic of Sara Taglialagamba's contribution. Here the interaction between scientific and artistic interests is very clear. Leonardo studied water not only from a technical point of view – from the deviation of the Arno to the irrigation of the French region of Sologne –, but with a view to geology as well – the erosive action of water; this knowledge allowed him to develop a project of fountains and garden illustrated by drawings in the *Codex Atlanticus*. The knowledge he expressed in his garden project represents the combination of the heritage from Antiquity – Hero of Alexandria, known through Leon Battista Alberti –, and works Leonardo was able to see in real life – like the fountain of Rimini –, a diversity of sources typical of the artisans' knowledge and which lies at the heart of our reflection. One century later, gardens had become real laboratories for hydraulic science thanks to the passion of great patrons for these symbols of political power. On that subject, Alette Fleischer's quotation from *Histoire de l'Académie royale des sciences* (1733) confirms the importance of the art of gardening for the development of sciences: "The beauty of the waters of Versailles was quite a new display to the world and every day it became more and more astonishing. It made the Science of Water fashionable; and Mathematics helped to make all things wild useful for the great King's pleasure and magnificence"[27].

The acquisition of knowledge by the observation of gardens is well illustrated in Bernard Palissy's description of his project for Queen Catherine de Médicis. A very picto-

rial passage describes the method he planned in order to colour the interior of some grottoes: the Huguenot ceramist tells his intention to cover the walls of the artificial caves with enamel, then to light a fire inside in order to obtain a randomly produced coloration which would imitate natural stones[28]. It is no coincidence that such a surprising method was directly inspired by his own practice as a potter, and the artificial stones are the same he collected and studied as a natural philosopher[29]. Not only do all the contributions presented here deal with the importance of material experience and practical abilities, but one of them was actually written by a professional in the field, the landscape architect Michael Simonsen, who proposes a historical evocation of Wollaton Hall, an exceptional construction built between 1580 and 1588, where the garden and residence attest to the English reception of humanistic and scientific influences from the continent.

This interdisciplinary collection of essays dedicated to gardens as "labs" aims at offering some keys to better understand the complexity of these peculiars places, real *Gesamtkunstwerke* and mirrors of Renaissance culture. Many Renaissance thinkers were convinced that Nature could teach us precious secrets concerning the meaning of life and Creation, and this is a conviction shared by many civilisations. From a historical point of view, gardens are definitely a fascinating field of study which can yield much information on the place of man in nature, as conceived in past centuries. The challenge will be to combine the results of our investigations with those obtained in other fields of art and knowledge. This dialogue, or rather interaction, presents a promising perspective, which the expression "hortus universalis" intends to evoke. In this sense, garden history perfectly embodies the multiplicity of interests characterizing the most innovative minds of the Renaissance.

Notes

1 On the conception of gardens as places of wisdom, and the continuity between Antiquity and Early Modern Period, see the excellent synthesis by H. Brunon, *Jardins de sagesse en Occident*, Paris, 2014.

2 J. Bennett and S. Mandelbrote, *The Garden, the Ark, the Tower, the Temple: Biblical Metaphors of Knowledge in Early Modern Europe,* exhibition (Oxford, Bodleian Library, 2 February - 2 May 1998), Oxford, 1998.

3 Bennett and Mandelbrote, *The Garden, the Ark, theTower, the Temple* (cit. n. 1), p. 8.

4 M. El-Abbadi, *The Life and Fate of the Ancient Library of Alexandria,* Paris, 1990; R.M. MacLeod, *The Library of Alexandria: centre of learning in the ancient world,* London-New York, 2000.

5 See the archeological study by M. De Franceschini, *Villa Adriana: mosaici, pavimenti, edifici*, Roma, 1991.

6 Erasmus, *Colloquies*, translated and annotated by Craig R. Thompson, Toronto, 1997, p. 175.

7 On this point see the suggestions given by Hervé Brunon in H. Brunon, *Jardins de sagesse*, Paris, 2014, pp. 25-26.

8 F. Bacon, *Of Gardens, Essay 46,* in F. Bacon, *The Essayes or Counsels, Civill and Morall, of Francis Lo. Verulam, Viscount St. Alban,* London, 1625, edited by C. Davis, Fontes 18, October 2008, http://archiv.ub.uni-heidelberg.de/artdok/volltexte/2008/617.

9 On Palissy see L. Amico, *Bernard Palissy: In Search of the Earthly Paradise*, Paris, 1996, and my PhD Thesis entitled *Artigiano delle Riforme. Artigiano delle riforme. Stile rustico e ricerca della sapienza nell'opera di Bernard Palissy (1510-1590)*, University of Verona and Ecole Pratique des Hautes Etudes, 2014. On his defence of practice, see my essay *Pratique vs Théorie dans l'oeuvre de Bernard Palissy, de l'art à l'épistémologie*, in the volume directed by V. Giacomotto-Charra and M. Marrache-Gouraud, to be published.

10 Cf. B. Palissy, *La Recepte véritable,* in *Œuvres complètes*, dir. M.-M. Fragonard et al., Paris, 2010, pp. 170-171.

11 See also A. Clegg, *Craftsmen and the Origin of Science*, "Science & Society", 18, 2, 1979, pp. 186-201. In the Nineties this interest grew and led to important studies like the following: A. Pickering, *Science as Practice and Culture*, Chicago, 1992; J.V. Field and F.A. James, *Renaissance and Revolution. Humanists, Scholars, Craftsmen and Natural philosophers in Early Modern Europe*, Cambridge, 1993; H. Verin, *La gloire des ingénieurs. L'intelligence technique du XVI^e^ au XVIII^e^ siècle,* Paris, 1993; N. Jardine, J.A. Secord and E.C. Spary, *Cultures of Natural History*, Cambridge, New York, 1996; A. Grafton and N. Siraisi, *Natural Particulars. Nature and the Disciplines in Renaissance Europe*, Cambridge (Mass.) - London, 1999.

12 During the Renaissance, the translation and diffusion of Virgil's works, *Eclogues* (42 BC) and *Georgics* (36-29 BC.), and Varro's *Rerum rusticarum libri III* (37 BC) inspired numerous treatises. On that subject see, C. Beutler, *Un chapitre de la sensibilité collective: la littérature agricole en Europe continentale au XVI^e^ siècle*, in "Annales. Économies, Sociétés, Civilisations", 28, 5, 1973, pp. 1280-1301.

13 P. Smith, *The Body of the Artisan,* Chicago, 2004.

14 See A. Pastore, *Gli ospedali in Italia fra Cinque e Settecento: evoluzione, caratteri, problemi*, Milano, 1992; A. Carlino, *La fabbrica del corpo. Libri e dissezione nel Rinascimento*, Torino, 1994.

15 For example Conrad Gesner who describes the effects on himself. See A. Serrai and M. Conchetti, *Conrad Gesner*, Roma, 1990; E.W. Gudger, *The Five Great Naturalists of the Sixteenth Century: Belon, Rondelet, Salviani, Gesner and Aldrovandi: a chapter of history of ichthyology*, in "Isis", 22 (1), 1934, pp. 21-40.

16 For a general study of European grottoes see the recent publication by H. Brunon and M. Mosser, *L'imaginaire des grottes dans les jardins européens*, Paris, 2014.

17 P. Morel, *Les grottes maniéristes en Italie au XVI^e^ siècle: théâtre et alchimie de la nature*, Paris, 1998.

18 On automats and the role of artisans in their conception see S.A. Bedini, *Patrons, Artisans and Instruments of Science, 1600-1750*, Aldershot, 1999; P. Weitmann, *Technik als Kunst: Automaten in der griechisch-römischen Antike und deren Rezeption in der frühen Neuzeit als Ideal der Kunst oder Modell für Philosophie und Wirtschaft*, Tübingen, 2011; L. Garai, G*li automi di Leonardo*, Bologna, 2007.

19 On Ligozzi see the catalogues of the recent exhibitions *Jacopo Ligozzi "pittore universalissimo"*, (Florence, 2014), Livorno, 2014 and *Jacopo Ligozzi: "altro apelle"*, (Florence, 2014), Florence 2014.

20 On the Rudolfine school and the role of naturalistic art see T. DaCosta Kaufmann's classical study, *The Mastery of Nature: Aspects of Art, Science and Humanism in the Renaissance*, Princeton, 1993; on Rudolf II's gardens see S. Dobalová, *The gardens of Rudolf II*, 2004, in "Studia Rudolphina" 4, 2004, pp. 61-65; S. Dobalová, *Zahrady Rudolfa II: jejich vznik a vývoj*, Praga, 2009; S. Dobalová, *Die Zi-*

truskultur am Prager Hof unter Ferdinand I., Maximilian II. und Rudolf II, 2014, in *Orangeriekultur in Österreich, Ungarn und Tschechien*, Berlin 2014, pp. 113-126; E. de Jong, *A Garden Book made for Emperor Rudolf II in 1593: Hans Puechfeldner's 'Nützliches Khünstbüech der Gartnereij'*, 2008, in *The Art of Natural History: Illustrated Treatises and Botanical paintings 1400-1850*, edited by T. O'Malley, A.R.W. Meyers, New Haven and London, 2008, pp. 186-203; see also L. Konečný, *Roelandt Savery, Rudolf II and the Bird of Paradise*, 2011, in "Studia Rudolphina" 11, 2011, pp. 133-135.

21 On this function of certain Renaissance paintings, see Bernard Aikema's interpretation of the *Tempesta* by Giorgione in B. Aikema, *Giorgione: La Tempesta*, Milan, 2003; see also on Brueghel M.A. Meadow, *Pieter Bruegel the Elder's Netherlandish Proverbs and the Practice of Rhetoric*, Zwolle, 2002, 153.

22 For example French naturalist Pierre Belon who describes plants he saw in Italian gardens he visited during his trip to Italy in his agriculture treatise: *Remontrances sur le défaut du labour et culture des plantes, et de la reconnaissance d'icelles, contenant la manière d'affranchir les arbres sauvages*, Paris, 1558. See also the famous letter written by Annibal Caro on 13 July 1538 from Naples to his friend and patron Giovanni Guidiccioni, which describes Giovanni's Gaddi's garden, in particular, its fountain and its grotto.

23 In the medical field see the important study by N.G. Siraisi, *Communities of Learned Experience: Epistolary Medicine in the Renaissance,* Baltimore, 2013.

24 For example, Paul Contant who spent several days in Padua and greatly appreciated the Orto botanico was allowed to collect and bring home some rare plants from that garden. Cf. P. Contant, *Commentaires sur Dioscoride*, XXXIX.

25 On Contant see the introduction in the edition by M. Marrache-Gouraud and P. Martin of P. Contant, *Jardin et cabinet poétique*, Rennes, 2004.

26 On French scientific poetry see the still classical study, A.-M. Schmidt, *La Poésie scientifique en France au Seizième siècle: Ronsard, Maurice Scève, Baif, Belleau, Du Bartas, Agrippa d'Aubigné*, Paris, 1910; more recently D. Wilson, *French Renaissance Scientific Poetry*, London, 1974; J. Céard, *La Nature et les prodiges*, Geneva, 1977; I. Pantin, *La Poésie du ciel en France dans la seconde moitié du Seizième siècle*, Geneva, 1995; on Du Bartas V. Giacomotto-Charra, *La forme des choses: poésie et savoirs dans «La Sepmaine» de Du Bartas*, Toulouse, 2009.

27 Quoted by Alette Fleischer in her essay: *Histoire de l'Académie royale des sciences*, 1665-99, 11 vol., Paris, 1733, I, p. 260.

28 Cf. B. Palissy, *La Recepte véritable*, in *Oeuvres Complètes*, dir. by M.-M. Fragonard, Paris, 2010, pp. 164-165.

29 On this aspect see my essay in the present volume.

Fig. 1. *Cretan plant*, in G. Pona, *Monte Baldo descritto da Giouanni Pona veronese*, Venice, 1617, p. 75.

The garden of nature: visualizing botanical research in Northern and Southern Europe in the 16th century

Florike Egmond*

A famous and still inspiring essay that first appeared in 1950, *Early Italian nature studies and the early calendar landscape*, by the Austrian art historian Otto Pächt, forms the starting point of this brief, comparative exploration of sixteenth-century horticulture and the visual study of plants (and some animals) in Northern Italy and the Southern Netherlands. Pächt argued that new forms of naturalism in the representation of living nature and landscape emerged in Northern Italy in the course of the 14th and 15th centuries. He suggested, moreover, that parallels for this visual development existed in the same period in the Burgundian areas, and proposed that these developments might not have occurred completely independently[1].

The main question here is: what happened immediately after Pächt's period in the specific field of nature study and its visual representation? Did parallel developments continue during the sixteenth century in those same two parts of Europe in so far as the pictorial rendering of living nature was concerned? And can the large amount of new research of the last decades concerning natural history, its practices, locations, exchanges, and visual aspects throw any new light on similarities and differences between northern (Southern Netherlandish) and southern (North Italian) ways of depicting plants and animals? The assumption is that all these ingredients were relevant to the ways in which plants and animals were represented[2]. This essay offers an exploratory and comparative look, therefore, at a field that has changed considerably in recent decades. Increasing importance is attached to practices and the notion of a visual culture that comprises much more than 'high art' and is embedded in a wider cultural, socio-economic, political, but also spatial setting[3]. Within that setting, we will pay special attention to the garden and its relation to the visual culture of nature.

Northern Italy

While horticulture and expert knowledge of wild plants are age-old, various practices linked with the more or less specialized investigation and exploration of living nature emerged – in so far as is now known – only in the early to mid sixteenth century[4]. Botanical fieldtrips, for instance, undertaken by European naturalists with the explicit

intention of exploring the flora of a particular region – a coastal zone, mountains, a valley – are documented since the 1520s-30s. Crete was a favourite location for botanical fieldtrips by Italians as well as North Europeans for much of the 16th century. The Swiss naturalist Conrad Gessner (1516-65) not only studied and cultivated plants in his own garden and those of fellow naturalists and plant collectors, but also explored the Swiss Alps during the 1540-50s. He was often accompanied by his painters and had drawings made of plants *in situ*. The Southern Netherlandish botanist Carolus Clusius surveyed and wrote the first floras of the Iberian Peninsula and 'Pannonia' (an area now part of Austria and Hungary) in the 1560-70s. And in Italy itself several different areas attracted the attention of sixteenth-century naturalists, both Italians and North European naturalist-physicians who combined the study of medicine in Northern Italy with a kind of botanical grand tour. The Monte Baldo close to Verona on the shores of Lake Garda was perhaps *the* favourite place in all of Europe for botanical field research, thanks to its many micro-climates and great diversity of plants. Significantly, it was compared at the time to a garden and nicknamed "Hortus Italiae" or even "Hortus Europae"[5].

The Veronese apothecaries Francesco Calzolari (1521-1600) and Giovanni Pona (1565-1630) published detailed descriptions of their fieldtrips on the Monte Baldo (respectively in 1566 and 1608/1617) in a genre perhaps best described as a mixture of travel literature and flora[6]. Pona's 'field guide' does not limit itself to the wild plants observed on the mountain, however, but also describes and illustrates wild and cultivated plants that he encountered on the way to the Monte Baldo in the environs of Verona and the gardens of the villas of the Veneto. These private botanical gardens housed a rich variety of indigenous plants as well as plants acquired from other parts of Europe and some imported exotica, even from America. The Venetian nobleman Nicolò Contarini (1553–1631), for instance, cultivated the exotic datura and kapok on his estate in the environs of Verona. Another botanical garden belonged to Cesare Nichesola (1556-1612), canon of the cathedral of Verona and collector of both plants and ancient inscriptions which were on display in his garden. Most private botanical gardens were open air living collections that were intrinsically connected with other collector's items, such as antiquities, books, albums with painted *naturalia*, *herbaria*, dried or stuffed *naturalia*, instruments, bronzes, ceramics, paintings, prints, and tapestries. Many such gardens were also the location of detailed observation and some experimentation, such as attempts to create new colour varieties and acclimatize plants from higher altitudes and sub-tropical or tropical zones. Pona's account testifies to the prominent presence of plants from Crete in the collector's gardens of the Veneto, which was directly connected with the fact that Venice ruled Crete for most of the sixteenth century. Crete was, moreover, a crucial stopover and entrepot in the trade between Venice and the Levant (in particular Constantinople)[7].

The apothecaries Calzolari and Pona by no means studied plants merely for their medicinal use, but their investigations do stand in the much older tradition of handwritten, richly illustrated herbals (books on health and plant medicine) that was particularly

important in Northern Italy in general and the Veneto in particular. Among the most famous such works are the Carrara Herbal from Padua, c. 1390-1404; the Codex Bellunese created c. 1430 in Belluno north of Venice; and the Herbal Roccabonella from Venice, c. 1430-40[8]. Although these large albums did not originate in identical social contexts, research of the last fifteen years suggests that all were linked with the learned traditions of medicine as taught at the University of Padua, in the hinterland of Venice, and with the practices of medical botany that were taking shape in this context. The emphasis on a combination of book learning and personal eye witnessing and critical observation was one of its traits.

Fig. 2. *Tragopagon or Barba hircina, and Solanum somniferum*, in *En Tibi herbarium* (circa 1542-1545), Leiden, Naturalis Biodiversity Center, Botany Department. These two species are now called Tragopogon pratensis L. or Meadow Goats' beard, and Atropa belladona, or Deadly Nightshade.

A unique characteristic that distinguishes these particular codices of the Veneto from most other herbals produced during this age is the naturalism with which the hundreds of plants are depicted. Copying from older herbals does occur as well, but a large number of the plants are depicted on the basis of direct observation – in gardens or in the wild, living or dried[9]. The Codex Bellunense, for instance, includes a large number of ordinary food plants and fruits – from cabbage to scarola and lentils, apples, figs and cherries – as well as wild plants that grow only in the Dolomites or even only in the area of Belluno. It would be tempting to think that the naturalism of these images was somehow inspired by or modelled after *herbaria* (collections of dried plants pasted on sheets of paper), were it not for the fact that the very earliest still extant herbaria date from the 1530s-40s, almost a century later than the plant codices of the Veneto: the herbarium that belonged to Gherardo Cibo, but may have been created by the physician-botanist from Viterbo Francesco Petrollini as early as the 1530s; and the anonymous *En Tibi* herbarium, probably from the area of Ferrara (c. 1542-44). Again, age-old practices involving plants used in medicine and cooking were 'professionalized' in the sixteenth century: searching for plants in the wild turned into systematic botanical fieldtrips; drying plants evolved into the creation of expertly dried plant collections on paper, orga-

nized according to whichever criterion was thought relevant. From the middle of the 16th century herbaria with dried plants can be found in various European countries: Germany, England, the Netherlands, and France, but the herbarium technique was presumably 'invented' by Luca Ghini (1490-1556), from 1527 lecturer and later professor of botany in Bologna[10].

Together with the publication of *printed and illustrated* herbals, floras and plant surveys (the main ones from the 1530s-1540s onwards), a whole list of practices mentioned above are regarded as key elements in the botanical revolution of the sixteenth century: systematic botanical field research; extensive plant collecting; the creation of both private and university botanical gardens; horticultural experimentation; herbaria with dried plants; and the visual documentation of plants in image collections with naturalistic representations. They were part of a major and to a considerable extent concerted attempt by European naturalists to map, describe, depict, identify and name the natural world. Book learning and knowledge of living nature dating back to antiquity remained major touchstones in this joint 'research project'. Many naturalists had a humanist background and were familiar with philological methods, which merged with first-hand observation and depiction, critical comparison, and the practices mentioned above. Visual naturalism, depicting plants in a way that made them easily recognizable and identifiable, was part and parcel of this approach[11].

As we have seen, many facets of the botanical revolution appeared early in Northern Italy (during the 1530s-40s), and were preceded by visual naturalism. If we look at the North Italian situation in the age immediately after Pächt's period, three aspects deserve special attention. The first is access to foreign and exotic plants, and the unique role of Venice. Until well into the sixteenth century, when major trade routes started shifting towards the Atlantic, Venice remained the hub in the European spice and drugs trade with the Far East and the Levant. Northern Italy was linked with Spain and the Atlantic, moreover, via Genoa. Living exotic plants travelled along the same routes, and Venice in particular offered unique access to such exotica (in the form of seeds, tubers, bulbs, and shoots or cuttings) from the Levant and after c. 1500-10 also from the New World. For example, most tulips and many other bulbs, the lilac and the horse chestnut reached Western Europe from Constantinople through either Venice or overland diplomatic contacts with Vienna that were intensified on account of the war between the Habsburg and Turkish empires. Venice's wealth and unique access help to make clear *how* wealthy collectors in its hinterland could create particularly rich and varied living collections with rare plants from abroad. Access to a wide range of indigenous plants was as abundant as well, thanks to the particularly varied flora of this region.

A second aspect concerns visual cultures and traditions. Pächt's findings about the emergence of early naturalism in Northern Italy and the fact that several herbals with such images were produced there at more or less the same time (1430-40s), indicates that new visual modes of representation had not merely been 'invented', but had begun to take root in the mid 15th century. It seems logical (but it is by no means easy to prove)

that the naturalia images produced in the following century in this same area continued what by then had become a visual tradition[12]. Four such examples come to mind, dating from between 1540 and c. 1610.

The earliest of these examples concerns the plant frescoes by the Florentine painter Francesco Ubertini, *il Bachiacca* (1494–1557). They were created after 1540, when he was appointed court painter by Cosimo I de' Medici. Bachiacca's frescoes on the walls and ceiling of the duke's private study are badly preserved, but his plant images are so lifelike that they have been called real 'portraits' of individual plants. Some plants are depicted flattened, exactly as they would be seen in a herbarium[13]. The second example concerns another court painter of the Medici: Jacopo Ligozzi (1547–1627) from Verona, who was appointed appointed in Florence in 1575 or 1576. Ligozzi was famous for his extraordinarily precisely and finely painted watercolours of plants and animals, many of which he observed in the Medici gardens and menageries[14]. Only a few years earlier, Giorgio Liberale from Udine (ca. 1527-1579/80) painted a large number of high-definition nature studies for Archduke Ferdinand II of Tyrol. Many of these depict the marine fauna of the Adriatic, from flying fish and dolphins to mussels and crabs. Liberale was equally adept at plant drawing: he made hundreds of model drawings for the woodcut illustrations in one of the most famous and widely read herbals of the sixteenth century: *Commentarii, in Libros sex Pedacii Dioscoridis Anazarbei, de Materia Medica* (Venice, 1554) by Pietro Andrea Mattioli (1501-1578 or 1577 *ab Incarnatione*)[15]. A final example concerns five albums with watercolours of some 1,000 plants commissioned or collected by the Venetian nobleman and botanical expert Pietro Antonio Michiel (c. 1510-1576) in the years 1545-75. A considerable number of the plant images were commissioned directly by Michiel from the Venetian painter Domenico dalle Greche and shows plants observed in gardens of the Veneto or in the wild. All of these images are realistic, detailed, and designed to facilitate plant identification, since they are often accompanied by enlarged insets of different colour varieties or of the flowers and fruits[16]. The works of Ligozzi and Liberale in particular evoke the strong colours and high precision of miniature painting (*miniare*), while Ligozzi, Liberale and Bachiacca were familiar via either family background or colleagues and artisans working at the same courts with the use of *pietre dure*, precious stones, gold and silver, and with tapestry and embroidery designs[17]. In other words, sixteenth-century highly realistic nature painting belonged to a wider cultural setting characterized not merely by learned and practical medical expertise but also by the very high-quality materials and artisanal craftsmanship to which the courts of Northern Italy had access.

A third aspect is the important but not yet sufficiently investigated role of private collectors (both physicians and noblemen) as transmitters of the visual tradition of naturalism. It seems to have been common since at least the 1530s – and probably considerably earlier – for wealthy and erudite members of the North Italian elite to have private botanical gardens and to collect living and dried naturalia, printed and manuscript books about nature as well as drawings of plants and animals. Since at least the 1540s,

Fig. 3. *Musk deer*, in *Gessner-Platter* albums, MS III C 23, 39, Amsterdam, Amsterdam University Library. This picture was a gift from Antonio Musa Brasavola to Gessner.

humanists, physicians and aristocratic collectors in Northern Italy were also involved in exchanges of drawings of naturalia and of the (living or dried) naturalia themselves with naturalists in other countries. Details of such exchanges emerge, for instance, from the collection of animal watercolours that belonged to the Swiss naturalist Conrad Gessner and served as models for the printed woodcut illustrations in his famous *Historia Animalium* (1551-1558). The drawing of a chameleon was a gift from Luigi Mundella (†1530) from Brescia, a professor of medicine in Padua. The Venetian nobleman Daniele Barbaro (1514-70) gave Gessner an image of a sunfish (mola mola) in 1552. And Antonio Musa Brasavola (1550-55), professor of medicine in Ferrara, naturalist, and personal physician to various Popes and kings, donated images of a sturgeon, a panther, a musk deer, and a South American coati to Gessner[18]. Several of these images were made by (anonymous) local painters in Italy, and even these few examples show that private collectors in Northern Italy commissioned and exchanged plant and animal images – perhaps not always of high artistic quality, but certainly painted in a naturalistic and descriptive manner[19].

Fourth, we should briefly draw attention to the relative proximity of the Habsburg courts in Innsbruck, Vienna and Prague, and the mutual influences between these Habsburg courts and the various North Italian ones in terms of naturalia collecting and general visual culture. The Habsburg courts of the late 16th century used to commission a whole range of luxury products from Milan. Their patronage extended to painters of naturalia from various parts of Europe, such as Giorgio Liberale from Udine and Arcimboldo from Milan, but also Georg Hoefnagel and Anselmus de Boodt (physician-mineralogist and painter) from Flanders[20]. Similarly, the Habsburg courts employed expert naturalist-physicians from both Italy and the Southern Netherlands, such as the Italian Mattioli and his Flemish counterparts Carolus Clusius and Rembert Dodoens.

Northern Italy thus presents a particularly interesting combination of excellent access to a rich variety of indigenous and exotic plants and animals, courtly patronage, a

profusion of wealthy collectors, a culture of collecting and gardening closely linked with humanist traditions, philological methods, observation, and a centre of medical learning. These seem to be some key ingredients of the cultural context of nature study in which the visual style of naturalism, the meticulous and detailed rendering in colour of plants and animals became the norm. This tradition of naturalist *miniare* did not disappear or diminish: it remained highly fashionable until at least the end of the 16th century in so far as the study of visual nature in drawings and watercolours was concerned, as did the inclusion of realistically depicted plants, fruits and animals in frescoes[21]. No break is visible in this respect with the period discussed by Pächt. It looks very much, therefore, as if two different visual traditions managed to live side by side in Northern Italy during this age: a high-definition and descriptive realism related to the *miniare* tradition which was used to represent living naturalia as realistically and precisely as possible, and a more narrative one used particularly in oil painting. Frescoes appear to have combined both.

The Southern Netherlands

Looking northwards, and seen from an Italian perspective, it may come as a surprise that several manifestations of the 'botanical revolution' – which we regard here as elements underpinning the visual culture of naturalism – occurred hardly any later and sometimes at the same time in the Southern Netherlands as in Northern Italy. We will concentrate again on the four aspects discussed above for Italy: access and distribution; private gardens and collectors; depicting naturalia; and court culture.

Antwerp and Venice have often been compared, but it may not be widely known that for most of the sixteenth century both cities were crucially important in terms of access to plants, animals, and information about living nature in other continents. Spices arrived via Lisbon from the Far East in Antwerp. As the emphasis in long-distance trade shifted from the Mediterranean towards the Atlantic in the course of this century, Antwerp became increasingly important as a distribution centre in the spice trade. Until its forced closure by the Dutch in 1585, the Antwerp port functioned as a gateway to northern Europe: it was destination or entrepot not merely for spices and plant-based ingredients for medicines, but also for rare plants and animals from Asia and Africa and (from the early 16th century onwards) the New World. The latter were literally rarities, and mainly destined to become collector's items. In 1520, for example, Albrecht Dürer acquired several live exotic animals in Antwerp and observed other rare naturalia there thanks to Portuguese merchants[22]. American naturalia arrived in Antwerp via the Fugger connection during the second quarter of the century, and some were shipped upstream into Germany. Perhaps the fact that the very earliest extant European drawings of the American sunflower and tomato (dated c. 1535-1565) in the collection of the botanist Leonhart Fuchs – as well as several of the earliest images of American fauna

and native population – were painted not in Spain or Italy but in Southern Germany can be explained by this America-Fugger-Antwerp connection[23]. Both before and after the port's closure and until well into the early 17th century, Antwerp was and remained a centre of naturalia study, collecting and specialized animal and plant painting, not to mention its role as home town of erudite circles of collectors-humanists[24].

Like Venice, but especially from the mid 16th century, Antwerp was also a crucial European printing centre, in which the Plantin presses fulfilled a key role as distributors of printed and illustrated information about living nature. Many of the printed works on plants by Rembert Dodoens (1517-85), which appeared between the mid 1530s and the 1580s (e.g. the *Cruydeboeck* of 1554), and all of the many botanical publications by Carolus Clusius from 1560 until 1611 (including his collected works *Rariorum plantarum historiae*, 1601; and *Exoticorum Libri decem*, 1605) were printed by the Plantin firm. Most of these were encyclopaedic publications, illustrated with huge numbers of woodcut images that were often re-used between various editions. Specialized Flemish plant painters created the original plant drawings on which these woodcuts were based. Peeter van der Borcht – one of Plantin's regular painters for both naturalia and religious subjects – was particularly prolific in the production of extremely high-quality naturalistic model drawings of plants[25].

Plantin's printed works on naturalia belong primarily to the second half of the 16th century, but other nature-connected practices in the Southern Netherlands go back to the very beginning of the 16th century and evince unbroken continuity between the Burgundian and Habsburg phases. This is particularly true for the closely interconnected traditions of expert horticulture (documented from at least the 1520s onwards) and elite naturalia collecting. The courts of Margaret of Austria (1480-1530) and Mary of Hungary (1505-58) in Malines and Brussels – who acted as Governors of the Southern Netherlands on Charles V's behalf – were particularly important. The Warande at Brussels with its park and impressive menagerie, the court residence at Malines, and Mary of Hungary's castle and hunting domain with gardens near Binche appear to have acted as focal areas from which the fashion of nature in all of its manifestations radiated both geographically and socially. Court circles had privileged access to rare naturalia, which arrived not only via Antwerp, but also via the routes of diplomatic exchange between the major Habsburg residences in Spain, Austria and the Low Countries. From the 1530s onwards, Netherlandish diplomats, such as Ogier Ghislain de Busbeq, were sent to Constantinople on behalf of the Habsburg rulers and came back with rare plants and gardening information. They themselves and their seeds, bulbs and tubers usually stopped off in Vienna or travelled part of the way by ship via Venice.

By mid-century, the collecting and cultivation of rare plants had become such a fashionable phenomenon that almost every self-respecting nobleman and noblewoman in the Southern Netherlands combined indoor collections with living plant collections in their gardens. The gardens of Granvelle and various noblemen and noble women linked to the Order of the Golden Fleece in the 1550s-1570s were particularly famous. Some

private collectors maintained personal exchanges with specialists, collectors and naturalists in Italy. Jean de Brancion (c. 1520-1575), for instance, had a garden with exotic plants in Malines during the 1560s, where the botanist Dodoens saw one of the first American sunflowers in Northern Europe. Brancion exchanged naturalia and information with some of the most famous Italian naturalists of his age: Ulisse Aldrovandi in Bologna, the physician and fish expert Ippolito Salviani in Rome, and Alfonso Pancio, naturalist and professor of medicine at Ferrara[26].

Fig. 4. *American sunflower*, in *Florum, et coronariarum odoratarumque nonnullarum herbarum historia*, by R. Dodoens, Antwerp, 1568, p. 295. This flower was seen by Dodoens, who lived in Malines near Jean de Brancion, in Brancion's garden.

Collections with rare plants that had often come from very different types of climates could flourish only because they were maintained by a host of expert gardeners, garden architects and irrigation experts, specialized nurserymen, florists, animal keepers, and so on. Information about such 'practical experts' seems to be hard to find for Northern Italy, but is slightly more accessible for the Southern Netherlands. 'Belgian' professional horticulture was already so important in the early 16th century, and the expertise in this field so high, that Charles V and subsequently his son Philip II hired whole teams (and over time several generations) of Flemish gardeners to create and maintain the royal gardens in Spain (Aranjuez). Vast numbers of plants and seeds were transported from nurseries in Flanders for this purpose[27].

At the very end of the 16th century the collections of Charles de Croÿ (1560–1612), Duke of Aerschot, give some idea of the coherence between the indoor and outdoor parts of such collections. Croÿ was one of the highest-ranking noblemen of the Southern Netherlands. He owned town houses, a castle, and an estate with a country house and garden as well as a *maison de plaisance* just outside Brussels. He collected paintings and prints, jewellery and precious stones, coins, statues and antiquities, curiosities, books, maps and manuscripts, furniture and precious textiles. And he had a special interest in *naturalia*. In Italian style, the Brussels estate included gardens divided into sections for

decorative plants, aromatic herbs and kitchen plants, and fruit trees. There were a grotto decorated with shells and pearls, an aviary, various waterworks and a pavilion. Indoors, wall decorations of wild animals complemented his collection of living *naturalia* and natural curiosities (birds, fish, shells, trees, herbs and flowers). He had a private distillery, and a personal physician as well as a personal botanist-pharmacist. Various animals formed part of his household: a cockatoo that raised its neck feathers, birds that could speak perfectly while others danced, a porcupine, civet cats, and even a seal that moved through his country house on its flippers[28].

Just as in Northern Italy, and quite early in the sixteenth century, the fashion of naturalia collecting spread from the courts and the highest nobility to the *noblesse de robe*, wealthy merchants and medical professionals (physicians, surgeons and apothecaries)[29]. Members of all these social strata were involved at least since the 1530s-40s in the creation of private botanical gardens, experimentation with plants, the acclimatization of plants from warmer climate zones, some botanical field exploration, and the creation of image collections of plants and animals drawn by expert painters. From at least the 1520s, wealthy Antwerp merchants constructed country houses (*maisons de plaisance*) with beautiful gardens in the environs of Antwerp. Just as in the Veneto, therefore, a culture of collecting sprang up in the environs of a great port city, influenced by aristocratic styles of display, luxury, and leisure. And just as in the Veneto, private botanical gardens functioned in the Southern Netherlands as both open air naturalia collections and experimental gardens.

The most famous of these was created just outside the Antwerp city walls in 1548 by the erudite pharmacist Peeter van Coudenberghe (1517-99), whose family belonged to the patriciate of Brussels. According to Guicciardini, it contained more than 400 exotic plants, besides many kinds of ordinary ones. Among the rare plants were the aloe from America, the dragon tree from the Canary Islands and Madeira, plants from the New World (such as Brazilian pepper, tobacco, ipomoea, tomato and guaiacum), the East Indies (such as cotton and zizyphus or jujube) and the Mediterranean (pomegranate, aubergine, a type of gladiolus, cypress and artichoke). Coudenberghe developed special spaces for (sub-)tropical plants, such as the so-called 'temperate or Flemish' protective structure and a basement where potted plants could survive the winter[30].

Coudenberghe's garden was almost exactly contemporaneous with the very first university gardens in Italy (Padua, Pisa) and the private botanical garden of Pietro Antonio Michiel in Venice. Indeed, the parallels between Coudenberghe and Michiel go further, since both experimented with plants and introduced and grew exotica from Asia and the New World. Both their collections were known to some of the most famous (German) naturalists of their age: Gessner and Fuchs. Whereas Michiel visually documented plants, however, it is unknown whether Coudenberghe ever commissioned drawings of his plants. His garden was destroyed during the siege of Antwerp in 1585, and he may have lost other parts of his collection as well. However, extant watercolours of a few exotic naturalia (a fruit of the baobab and a nut of the faufel palm) go back to items

in Coudenberghe's collection. They were drawn during the 1560s by Plantin's painter Peeter van der Borcht, commissioned perhaps directly by Plantin but more probably by the botanist Clusius. The latter used these drawings as models for woodcut illustrations in his heavily edited edition of Garcia da Orta's famous work on Indian medicinal plants – one of the most widely read works on tropical plants of the early modern period[31].

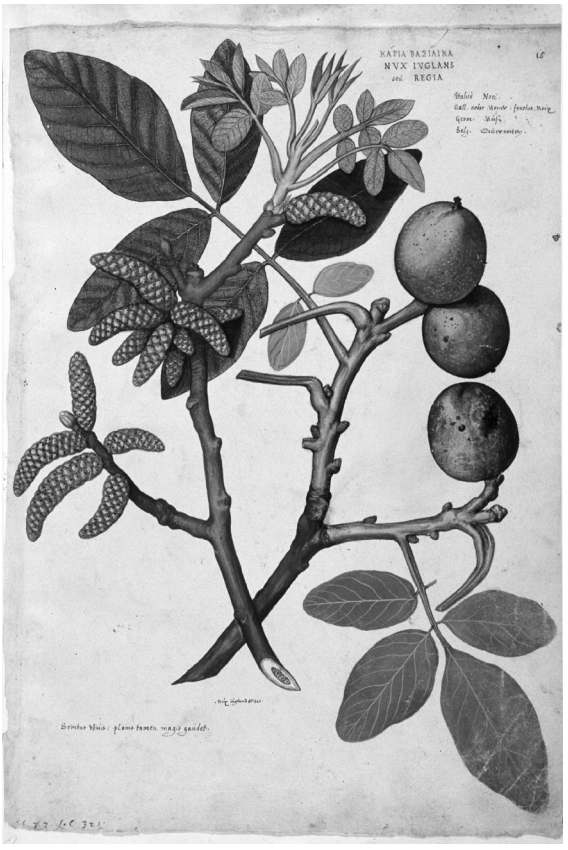


Fig. 5. *Walnut*, c. 1560, in *Libri Picturati*, A 20, f. 85, Kraków, Jagiellonian Library.

Van der Borcht is once more a key figure as one of the probable painters involved in the creation of the largest extant Flemish collection of (some 1,500) plant and some animal watercolours. The core group of the *Libri Picturati* A.16-31 drawings was commissioned during the 1560s by the nobleman-collector Charles de Saint Omer (probably advised by his protégé, Clusius); the later owner Count Charles d'Arenberg added further images towards the end of the sixteenth century[32]. Like the contemporary drawings commissioned by Michiel, this massive collection of very high-quality *naturalia* drawings was therefore created by a nobleman-collector, commissioned from a local painter, and brought together partly in order to visually document, study and 'organize' living nature. In terms of naturalism and painterly quality, the refined and highly detailed naturalism of the *Libri Picturati* drawings is almost unequalled. The closest comparison would be with the contemporary Jacopo Ligozzi, or with the later generation of more famous Flemish naturalia painters associated with the Habsburg courts in Vienna and Prague, such as Georg and Jacob Hoefnagel. They too came from the Antwerp region. Just as their fine drawings of naturalia have been linked with the Dürer Renaissance and with trompe l'oeil effects of the illuminated manuscripts from the Burgundian period, the *Libri Picturati* drawings can be connected with that same uninterrupted tradition of Southern Netherlandish *miniare* and hyperrealism[33].

In terms of visual documentation of plants and animals, the main differences between the Southern Netherlands and Northern Italy seem to concern *not* the adoption of a style of high-definition naturalism, but the available quantity of visual material; a slightly different chronology; and somewhat different emphasis in media. In the Southern Nether-

lands frescoes are virtually lacking – as is understandable for climatic reasons – but that absence is more than compensated by the abundance of extremely high-quality *Verdures*: tapestries depicting plants and animals in a lifelike manner, which were often modelled on printed illustrations of naturalia. Flemish *Verdures* became so famous that they were commissioned by courts all over Europe (Spain, Poland, Italy), and Flemish tapestry weavers were hired by the Medici to help set up their own tapestry ateliers in Florence[34].

Chronologically, the emphasis in Southern Netherlandish representations of plants and animals (whether on *Verdures*, in drawings and watercolours, printed works, paintings, or other decorative arts) belongs to the second half of the sixteenth century rather than the first. In so far as known at present, no large groups of Flemish plant or animal drawings from the first half of the 16th century have survived. But just as in Italy, the category of private collectors and garden owners is still underresearched in the Southern Netherlands. It is by no means unthinkable that new visual material may still emerge from private archives and collections. Furthermore, the relative lack of such visual sources for the first half of the sixteenth century may not reflect a real absence in history of such material, but may be the consequence of the subsequent destruction and emigration of collections in and from this area. Two particularly devastating phases of warfare hit this area. First came the Dutch Revolt which started in the early 1560s, the concomitant warfare in the Southern and Northern Netherlands, the siege of Antwerp, the closing of its port, and the emigration for religious or economic reasons of large numbers of inhabitants with some of their prized possessions. Second, Belgium was a theatre of war during much of the First World War – which led to an almost unimaginable loss of library and archive collections. It may not be a coincidence that some of the best-known and most exquisite Belgian works with naturalistic representations of naturalia are found outside this country. The 1,500 *Libri Picturati* drawings survived from the very early 17th century on in German (Prussian) collections. As a consequence of the Second World War they are now in Krakow (Poland), only a short distance from the famous Wawel *Verdures* in the same city that were originally commissioned from Flemish weavers by the Polish Kings. And the insect and flower drawings by Hoefnagel have become world-famous as part of the imperial collections of Vienna and Prague.

Conclusion

Returning to our main question, there seems to be no sign of a break in the visual tradition of naturalism in either the Low Countries or Northern Italy after the age discussed by Otto Pächt. In both the Southern Netherlands and Northern Italy the emphasis on highly detailed, descriptive *miniare* and an extremely realistic representation of living creatures grew only stronger, remained in high fashion in all levels of society, and manifested itself in media from watercolours and drawings to tapestries, and from decorative arts to oil painting.

Pächt has pointed out that the developments in naturalist painting in Northern Italy and the Burgundian areas may have been interconnected. Research of the last few decades into the cultures and exchanges of natural history and collecting during the sixteenth century has demonstrated a very high degree of interconnectedness for our period. The 'research agenda' of European naturalists had shared priorities; elite collecting all over Europe shared the idiom of rarity. Both collecting and research in the domain of the life sciences were connected with the shared visual idiom of high-definition naturalism, which indeed became the stylistic norm for the visual representation of naturalia in the professional study of nature all over Europe. Very few spaces and locations were more important to the development of early naturalism than the garden: source of food and medicine, *locus amoenus*, place of study and experiment, and living collection.

Notes

* The research for this article was done as part of the NWO-funded project *Re-reading the Book of Nature* (2010-2014), based at the University of Leiden. With thanks to Peter Mason, Giuseppe Sandrini, and the organizers of and participants in the meeting *Nel laboratorio del Rinascimento. Scienza e arte nei giardini europei tra '500 e '600* at the University of Verona.

1 O. Pächt, *Early Italian nature studies and the early calendar landscape*, in "Journal of the Warburg and Courtauld Institutes", 13, 1950, pp. 13-47. For a new Italian edition of this essay see *La scoperta della natura. I primi studi italiani,* edited by F. Crivello, with an introduction by E. Castelnuovo, Turin, 2011.

2 I limit myself, therefore, to nature study and practices, and will not go into the wider field of the sciences, natural philosophy, or artistic genres such as still life.

3 One of the influential early publications representing this approach is *Cultures of natural history*, edited by N. Jardine, J.A. Secord and E.C. Spary, Cambridge, 1996.

4 New information is continually emerging from archives and libraries, and it is by no means impossible that earlier evidence exists but has not yet been found or analysed.

5 For general works on 16th-century botany, see B.W. Ogilvie, *The Science of Describing. Natural History in Renaissance Europe*, Chicago and London, 2006; and the still excellent K. Reeds, *Botany in Medieval and Renaissance Universities,* New York, 1991. Many of these fieldtrips are discussed in F. Egmond, *The World of Carolus Clusius: Natural History in the Making, 1550-1610*, London, 2010.

6 F. Calzolari, *Il viaggio di Monte Baldo,* Venice, 1566; see *Francesco Calzolari, il viaggio di Monte Baldo, con la Testimonianza sul Museo Calzolari di Ulisse Aldrovandi,* edited by G. Sandrini, Verona, 2007. G. Pona, *Plantae, seu simplicia, ut vocant, quae in Baldo Monte [...] reperiuntur,* Basel, 1608; I have used the expanded Italian edition: G. Pona, *Monte Baldo descritto da Giouanni Pona veronese,* Venice, 1617.

7 The close connection between archaeology and botany is well-known. For a recent essay specifically on this topic, see A. Carlino, *Nel solco di Roma tra filologia e autopsia*, in *Rome et la science moderne entre Renaissance et Lumières*, edited by A. Romano, Rome, 2008, pp. 323-346.

8 The first two codices are in the British Library, London; the third, also known as the Herbal of Benedetto Rinio, is in the Biblioteca Marciana in Venice. An excellent comparative essay by Giordana Mariani Canova on these codices can be found in the facsimile edition of the Codex Bellunensis: *Codex Bellunensis. Erbario Bellunese del XV secolo,* Feltre-Belluno 2006.

9 See W. Blunt and S. Raphael, *The Illustrated herbal,* London, 1979; and M. Collins, *Medieval herbals. The illustrative tradition,* London, 2000; and *Visualizing Medieval Medicine and Natural History*, 1200-1550, edited by A. Givens, K. Reeds and A. Touwaide, Aldershot, 2006.

10 The Cibo-Petrollini herbarium is in the Biblioteca Angelica, Rome; the *En Tibi* herbarium in the University Library of Leiden. On Cibo, see *Gherardo Cibo. Dilettante di botanica e pittore di 'paesi'. Arte,*

scienza e illustrazione botanica nel XVI secolo, edited by G. Mangani and L. Tongiorgi Tomasi, Ancona, 2013.

11 Besides Ogilvie, *The Science of Describing,* and Reeds, *Botany in Medieval and Renaissance Universities* (both cit. n. 6), see Richard Palmer, *Medical Botany in Northern Italy in the Renaissance*, in "Journal of the Royal Society of Medicine", 78 1985, pp. 149-157; and R. Palmer, *La botanica medica nell'Italia del Nord durante il Rinascimento*, in *Di Sana Pianta. Erbari e taccuini di sanità. Le radici storiche della nuova farmacologia*, edited by R. Bussi, Padua, 1988, pp. 55-60.

12 Naturalism and 'lifelike representations' involved selection, highlighting and emphasis on certain aspects of plants and animals. But that issue goes beyond the purposes of the present essay, and is discussed in my forthcoming *Eye for Detail: drawing plants and animals between art and science, 1530-1630.*

13 Bachiacca also made lifelike animal paintings for Cosimo. See F. Vossilla, *Cosimo I, lo scrittoio del Bachiacca, una carcassa di capodoglio e la filosofia naturale*, in "Mitteilungen des Kunsthistorischen Institutes in Florenz", 37 (2-3), 1993, pp. 381-395; and M.A. Signorini, *Sulle piante dipinte dal Bachiacca nello scrittoio di Cosimo I a Palazzo Vecchio*, in "Mitteilungen des Kunsthistorischen Institutes in Florenz", 37 (2-3), 1993, pp. 396-407. More generally, see *Natura viva in casa Medici*, edited by M. Mosco, Florence, 1985; and M. Horowitz, *Humanist horticulture: twelve agricultural months and twelve categories of books in Piero de' Medici's* Studiolo, in "Viator", 34, 2003, pp. 272-307.

14 See *Jacopo Ligozzi "pittore universalissimo"*, edited by A. Cecchi, L. Conigliello and M. Faietti, Livorno, 2014.

15 Mattioli's first edition of 1544 is not illustrated.

16 Most images are still unpublished after almost 500 years; a selection was published in the edition of the text of Michiel's albums: *Pietro Antonio Michiel. I Cinque Libri di Piante. Codice Marciano,* edited by E. De Toni, Venice, 1940; and some further ones in *Di Sana Pianta* (cit. n. 12).

17 Ligozzi, for instance, designed cartoons for *pietre dure*. See L. Tongiorgi Tomasi and G.A. Hirschauer, *The Flowering of Florence: Botanical Art for the Medici*, Washington D.C., 2002; and A.M. Massinelli, *The Gilbert Collection hardstones*, London, 2000, pp. 10, 74, 80.

18 This coati drawing is the earliest-known European image of this animal.

19 For exchange and copying of original (fish) drawings, see F. Egmond and S. Kusukawa, *Circulation of images and graphic practices in Renaissance natural history: the example of Conrad Gessner*. This article – with the same title – will now appear elsewhere, in the journal "Gesnerus" (June 2016), in press.

20 *Arcimboldo. Artista milanese tra Leonardo e Caravaggio*, edited by S. Ferino-Pagden, Milan, 2011; and *Von Fischen, Vögeln und Reptilen. Meisterwerke aus den kaiserlichen Sammlungen*, edited by C. Weiler, Vienna, 2011.

21 The frescoes often show combinations of realistic and fantastic plants and animals with monsters, grotesques, mythological scenes and views of landscapes and gardens. Well-known examples are the frescoes of the 1510s with identifiable images of American fruits in the Villa Farnesina, Rome; and the ceiling frescoes in the Uffizi, Florence (1580s). See P. Morel, *Les Grotesques. Les figures de l'imaginaire dans la peinture italienne de la fin de la Renaissance,* Paris, 1997.

22 See especially D. Eichberger, *Naturalia and artefacta: Dürer's nature drawings and early collecting*, in *Dürer and his culture*, edited by D. Eichberger and C. Zika, Cambridge, 1998, pp. 13-37; and J.M. Massing, *The quest for the exotic: Albrecht Dürer in the Netherlands,* in *Circa 1492. Art in the Age of Exploration*, edited by J. Levenson, New Haven and London, 1991, pp. 115-119.

23 The Fuchs collection of some 1,500 botanical drawings remained largely unpublished in his time. It is now in the Oesterreichische Nationalbibliothek Vienna. On early Americana in South Germany, see J.M. Massing, *Early European images of America: the ethnographic approach*, in *Circa 1492. Art in the Age of Exploration*, edited by J. Levenson, New Haven and London, 1991, pp. 515-520.

24 See *Embattled Territory. The Circulation of Knowledge in the Spanish Netherlands*, edited by S. Dupré, B. De Munck, W. Thomas and G. Vanpaemel, Ghent, in press; and *Translation in the Early Modern Low Countries*, edited by S. Dupré and H. Cook, Berlin 2013.

25 On Van der Borcht, see C. Depauw, *Peeter van der Borcht (1535/40-1608): de kunstenaar als inventor of creator van botanische illustraties?*, in *De Botanica in de Zuidelijke Nederlanden (einde 15e eeuw - ca. 1650)*, edited by F. de Nave and D. Imhof, Antwerp, 1993, pp. 47-56. A.J.J. Delen's still useful *Histoire de la gravure dans les Anciens Pays-Bas et dans les Provinces Belges des origines jusqu'à la fin du XVIII^e siècle,* Vol. 2, *Le XVI^e siècle, les graveurs, illustrateurs,* Paris, 1934, p. 83, states that Van der Borcht

created the images for all the botanical works (and many others) published by Plantin from 1563 to 1583.

26 See the chapter on botany and collecting in the Southern Netherlands in Egmond, *The World of Carolus Clusius*, pp. 11-44 (cit. n. 6).

27 *Ibidem.*

28 On Croÿ's estate near Brussels, see C. de Maegd, *"En ung sien jardin de plaisance au faubourgs de ceste ville": Het hof van plaisantie van Karel van Croÿ in Sint-Joost-ten-Node rond 1600*, in "Tijdschrift van Dexia bank", 55, 218, 2001, pp. 45-68; and C. de Maegd, *Tuinbezit, tuinen en tuinlui: een licht op de praktijk in de tijd van Vredeman de Vries,* in: *De wereld is een tuin. Hans Vredeman de Vries en de tuinkunst van de Renaissance*, edited by P. Fuhring, Ghent, 2002, pp. 69-87.

29 Literature on horticulture, botany, collecting and depicting naturalia in the early modern Southern Netherlands is not always easily accessible, very dispersed, and sometimes very old. A key publication is *De Botanica in de Zuidelijke Nederlanden* (cit. n. 26).

30 L. Vandewiele, *Wat groeide in de tuin van Pieter van Coudenberghe*, in *De Botanica in de Zuidelijke Nederlanden* (cit. n. 26), pp. 23-31. *Peeter van Coudenberghe: Apotheker-botanicus (1517-1599) en tijdgenoten: De natuur als verzamelobject in de 16de eeuw*, edited by G. de Munck and H. Wille , Antwerp, 1996.

31 Carolus Clusius, *Garcia ab Horto, Aromatum et simplicium aliquot medicamentorum apud Indos nascentium historia*, Antwerp, 1567. See F. Egmond, *Figuring exotic nature in sixteenth-century Europe: Garcia Da Orta and Carolus Clusius*, in *Medicine, Trade and Empire: Garcia de Orta's* Colloquies on the Simples and Drugs of India *(1563) in Context*, edited by P. Fontes Da Costa, Farnham, 2015, pp. 167-193; and P. Fontes da Costa, *Geographical expansion and the reconfiguration of medical authority: Garcia de Orta's Colloquies on the Simples and Drugs of India (1563)*, in "Studies in History and Philosophy of Science", 43, 2012, pp. 74-81.

32 See *Drawn after nature. The complete botanical watercolours of the 16th-century Libri Picturati*, edited by J. de Koning, G. van Uffelen, A. Zemanek, B. Zemanek, Zeist, 2008.

33 See M. Rikken, *Abraham Ortelius as Intermediary for the Antwerp Animal Trailblazers*, in "Jahrbuch für Europäische Wissenschaftskultur / Yearbook for European Culture of Science", 6, 2011 (2012), pp. 95-128. Her forthcoming dissertation analyses the development of Southern Netherlan-dish animal imagery into an autonomous genre in art between 1550 and 1650.

34 T.P. Campbell, *Tapestry in the Renaissance: Art and Magnificence*, New York, 2002.

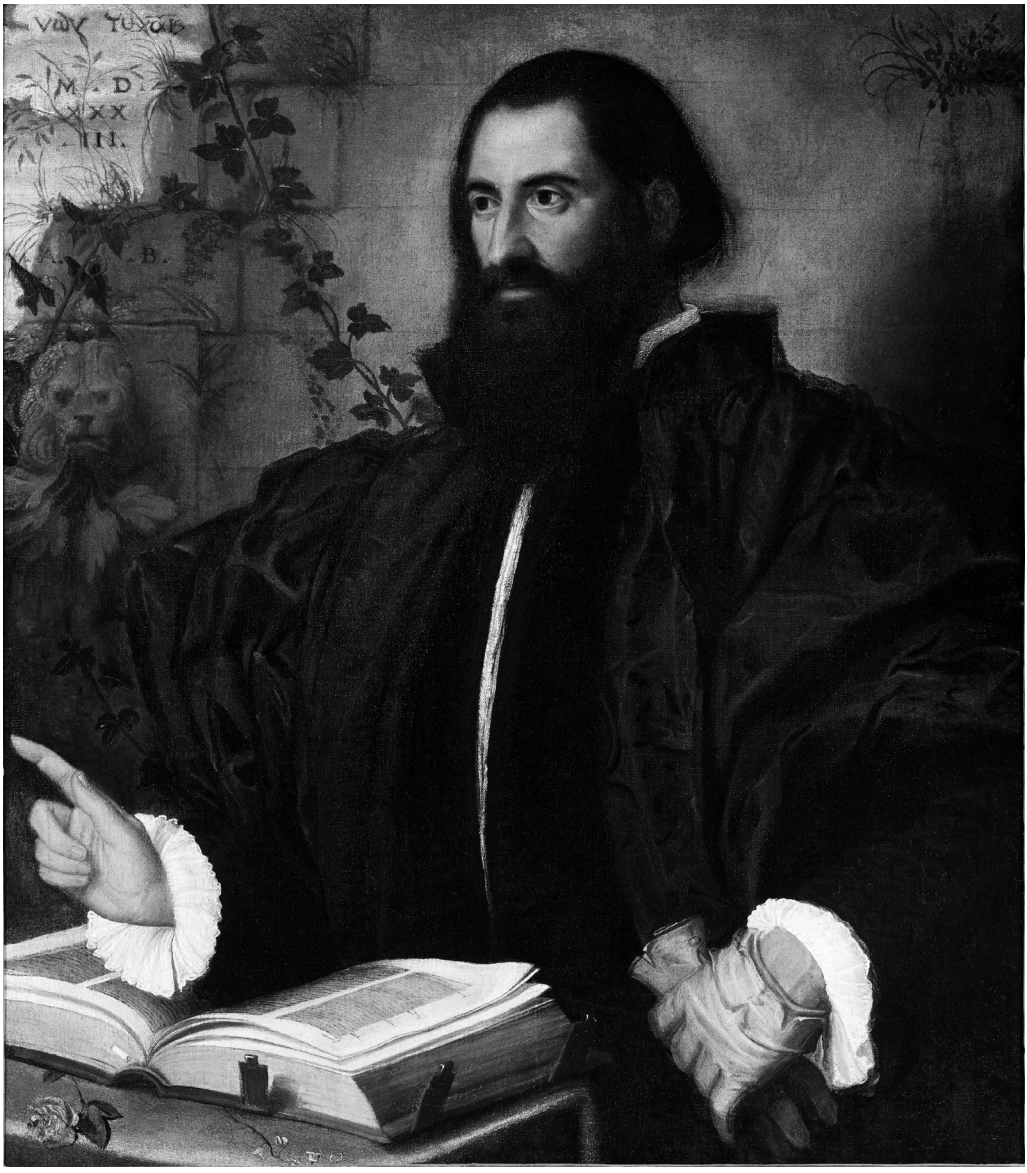


Fig. 1. Alessandro Bonvicino, called Moretto da Brescia, *Portrait of a botanist*, Genoa, Musei di Strada Nuova, Palazzo Rosso.

The Many Gardens – Real, Symbolic, Visual – of Pietro Andrea Mattioli

Luca Ciancio

That the rise of the Renaissance garden and the rebirth of botany as a science of observation were events that occurred during the same period is a rather obvious fact. Scholars generally agree in dating the former to the period between the creation of gardens in the Medici villas in the second half of the fifteenth century and the spread of gardens based on this model to other parts of Italy during the first half of the following century[1]. As regards the history of botany, the resurgence of that discipline in the modern age may be dated to between the first printed editions of the works of Pliny, Theophrastus and Dioscorides in the final decades of the fifteenth century and the foundation of botanic gardens in Pisa (1543-44) and Padua (1545)[2]. Also obvious is the common social context in which these two processes took place: the Italian courts during the age of decline of the local regional states. The fact that these phenomena occurred approximately at the same time and in the same area is certainly no coincidence and it suggests the existence of an intrinsic relationship between them.

This hypothesis, however, has by no means been proven nor even investigated in detail. Since invoking a generic process of rediscovering nature usually attributed to the Renaissance would be of little help, I prefer to attempt to document the real experiences of co-operation and exchange among people who were involved in both areas; and it will be necessary to specify clearly both the kinds of knowledge they had and the variety of interests that engendered their relationships[3]. Only in this way shall we be in a position to understand to what extent the encounter of the culture of physicians/naturalists with the motivations and attitudes of ruling elites really favoured an interdependent development of the two processes[4]. The career of the great Sienese botanist Pietro Andrea Mattioli (1501-1578) is in many respects emblematic of a medically trained naturalist whose rise depended on the patronage of cardinals and sovereigns and it can offer a privileged vantage point from which to examine this topic[5]. In fact, a look at several moments along Mattioli's scientific pathway should make it possible to answer two fundamental questions. What was the relative importance of the various types of gardens Mattioli frequented for the purpose of his research activities? How and to what extent did the knowledge he possessed contribute both to the creation of gardens in his patrons' residences and to the fulfillment of their functions? This should allow us to shed light on those aspects of botanical culture that were attractive for aristocratic patrons and enhanced the intellectual status of natural history.

1. *The Gardens of Nature*

Little precise testimony has come down to us about Pietro Andrea Mattioli's visits to gardens during his university education in Padua around 1520-1523 and later on when he began his early professional activities in Siena, Perugia and Rome, somewhere between 1523 and 1527[6]. As a physician, he must have been knowledgeable about the therapeutic use of simples; it is also highly likely that he was able to access apothecaries' gardens and aristocratic gardens in the Rome of Clement VII. An interesting clue is the evidence of contacts with the banker and patron Agostino Chigi (1465-1520), holder of the pontifical alum monopoly in Tolfa, an area where Mattioli resided for two years[7]. Around 1509 Chigi had commissioned the Villa Farnesina from Sienese artist Baldassare Peruzzi whose vast garden "arranged in regular flowerbeds and adorned with fountains" extended from via della Lungara to the Tiber[8]. However, the available facts would appear to confirm the opinion of Mattioli's first biographer who states that before he came to live in the Principality of Trento his main area of research was not botany but medicine, especially human anatomy as a way to study pathology[9].

Mattioli arrived in Trento in 1527 and shortly thereafter was hired as family physician and advisor of the prince-bishop Bernardo Cles (1485-1539), a figure of extraordinary importance in European politics during the three decades leading up to the Council of Trento[10]. During the time of his residence in the Val di Non up to the early 1530s (fig.1)[11] Mattioli conceived and began working on his commentary on Dioscorides' *De materia medica* which was published in 1544[12]. In dedicating the fruit of "this new garden of his" to Cristoforo Madruzzo, Cles' successor as prince-bishop of Trento, he expressed his aim to restore the "ill cultivated garden [of medical botany] to its original and true pristine state". In his view, the "flourishing garden of Medicine" transmitted to us by the classical sources had been allowed to "grow wild and, through mere neglect reduced to a poor state" by 'the negligence and ignorance of our predecessors". This task had required "no small effort and diligence on the part of several noble minds" including Ermolao Barbaro, Leoniceno, Mainardi, Corti, Fracastoro, Montano and Vesalio. Nonetheless, much remained to be done and the work involved more than simple philology. To reestablish the "truth of matters", a patient and tireless research work had to be carried out in the field. As he claimed, "now through dense forests, now on lofty and steep mountains, now on gentle and pleasant hills, now in dark caves, […] now through the private gardens of the most famous and important cities, I have wandered with great effort"[13].

As I have shown elsewhere, the natural surroundings in which Mattioli was able to operate between 1527 and 1541 were essential for the pursuit of this aim. An examination of the 1544 edition shows more than eighty references to places near Trento, some thirty of them just in the Val di Non, a mountain area he described as "a real spectacle of beautiful simples"[14]. These references show that Mattioli's vast knowledge of the natural history of the Trentino region was the product of systematic exploration and botanizing. With regard to herbals, themselves a kind of garden, we have an important declaration

of his dating to 1553: "I have never used herbals, as I am always content with the garden of Nature and what I have now engraved in the book"[15]. On the other hand it is not clear whether Mattioli had a medicinal garden available to him at his residence[16]. It is however certain that he had ongoing relationships with a number of pharmacists who procured for him the substances he needed for the preparation of drugs[17]. Among the local apothecaries he mentions Giovanni Alberto Parolini "apothecary […] to the blessed Simone", Piero Spezzalancia "my beloved friend" and others like Martino Guidottini and Santo Santini. Among the gardens he frequented in Trento, Mattioli mentions one belonging to the convent of San Francesco and the garden of an unnamed "canon" of Trento; in Bolzano the garden of Biagio Spaicher "physician and most excellent herbalist, my very close friend"[18].

His frequenting of medicinal gardens was not limited to Trentino. In 1536 Mattioli took part in the mission that led his patron Bernardo Cles first to Bologna and later in March to Naples for a meeting with the emperor Charles V. This trip provided him with the opportunity to visit the city's gardens, including one "on the way to Pe di Grotta", "the very large garden" of the cardinal Pompeo Colonna; as well as the chance to frequent Neapolitan apothecaries[19]. From the pages of his 1544 work another interesting fact emerges. In the years before the creation of the botanical garden in Padua, Venice was the place Mattioli was most attracted to in his study of simples; and not only because Venice was a centre of long-distance spice trading, but for the precise reason that many medicinal gardens were located in the city. We have to remember that before going to university in Padua, Mattioli had lived with his family in Venice where his father practiced medicine. But it was in the 1530s or 1540s that he frequented the "noble garden of rare and glorious herbs of the most excellent physician Messer Mapheo de Maphei" in Cannaregio[20]. In this period, apothecaries' gardens were important for Mattioli not just because they supplied him with drugs, but also in relation to his commentary on Dioscorides since they gave him the chance to examine living examples of plants from the East. Precise references confirm the importance of his relationship with Venice. Mattioli mentions, for example, that he had received from the influential Giambattista Ramusio a "fruit" of sage from Crete[21]. That he frequented the Republic's most influential intellectual milieus is confirmed by his choice of Francesco Marcolini as printer for his work *Il Magno Palazzo* (1539) which I shall return to shortly. Mattioli must have been acquainted with both of Marcolini's gardens, his "real" garden on the island of Giudecca and his metaphorical garden represented by the circle of men of letters who – thanks to Pietro Aretino and Antonfrancesco Doni – contributed to his literary output between 1534 and 1559[22].

2. *The Cardinal's Gardens*

It is well known that Mattioli's patron, cardinal Bernardo Cles, was interested in botany, not just as a science but also for its literary, symbolic and artistic values. This is

also suggested in Cles' choice of a personal emblem depicting a laurel leaf intertwined with a flowering palm branch[23]; and it is confirmed by the presence in the prelate's library of various botanical works[24]. But where Bernardo Cles' passion for botany and floriculture found its crowning expression was in the creation of the gardens of his new palace in Trento. When Mattioli was invited to the court of Bernardo Cles, in 1527 or more likely 1528, the great Tridentine politician and churchman had already launched on a project of architectural renovation of the city and its surroundings whose artistic and political high point was the new wing of the Buonconsiglio castle called the Magno Palazzo.

The archival sources tell us that from 1531, laying out a garden in front of his palace became a matter of increasing importance for the cardinal, a garden whose reference model was to be the "fifteenth century Italian garden which Leon Battista Alberti had treated exhaustively in the ninth book of *De re aedificatoria*"[25]. Some essential indications about the original structure of the gardens have come down to us from a plan of the Buonconsiglio castle made in 1542 (fig. 2)[26]. According to this source, the main garden located between the Palace and the walls, was divided into three sectors: a rectangular strip that separated the walls from the Magno Palazzo's west façade; on a higher level a square section in front of the library and the loggia, and a third triangular section, the southernmost between the walls and Torre Aquila[27]. The geometric regularity of the areas made it possible to lay out quadrangular flowerbeds separated by narrow paths. At the centre of the area in front of the loggia there stood a great fountain dedicated to Neptune and composed of stone basins and statues. Water flowed through a series of channels that fed secret waterworks designed for displays of *giochi d'acqua* designed to surprise visitors. Inside the loggia the visitor could admire a miniature mechanical landscape powered by a hydraulic device, one of the first ever built in Italy[28].

Mattioli's prestige as a natural philosopher and his role as counselor at court might lead us to expect that he had played a direct role in planning and creating the garden, but the sources do not bear this out[29]. An accurate reconstruction of the events reveals a discontinuity in the persons in charge of designing the garden. It is impossible to identify a single designer other than the cardinal himself who, even from as far way as his residence in Vienna, often intervened with urgent instructions to his superintendents. We know that in addition to citrus trees, the garden was planted with ornamental, medicinal and odoriferous herbs as well as with bushes suitable for the art of topiary. However, in the absence of hard evidence we can only conclude with Gabrielli that Mattioli "perhaps collaborated with the cardinal" in selecting the prized plants the prelate was after[30].

Further details, though quite unrelated to the garden's construction, may be found in Mattioli's encomiastic poem *Il Magno Palazzo del Cardinale di Trento* published in Venice in 1539; a "pleasant digression" in which the Sienese physician, in the guise of a courtly man of letters, extols his patron's merits and virtues by illustrating at length his most important architectural creation. The octaves 416-420 provide precise information about the floral and botanic choices that were made. Among the plants Mattioli describes

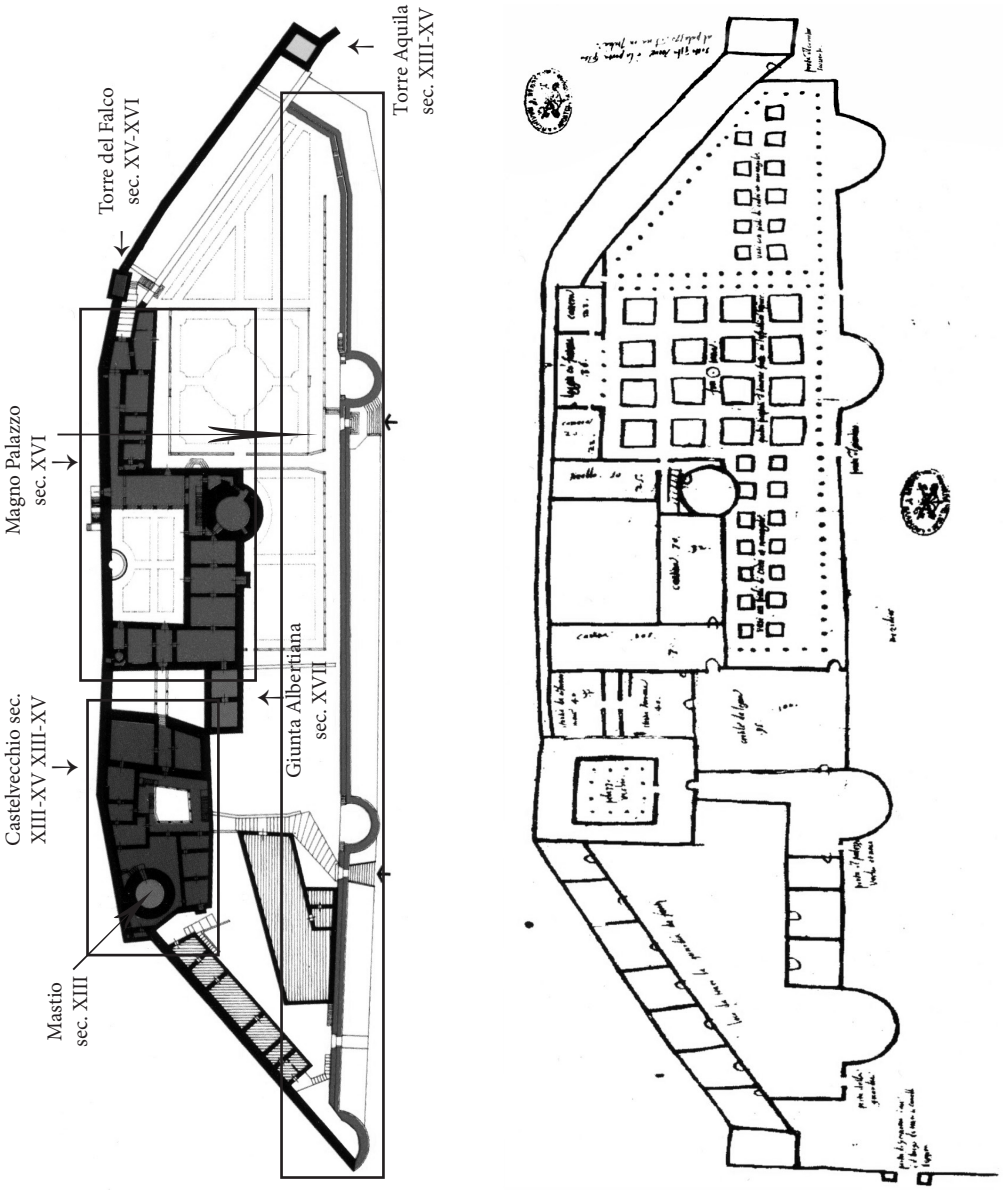


Fig. 2. Anonymous, *Desegno del palazzo di Trento*, plan, Vatican city, Archivio Segreto Vaticano. Here compared with an actual plan of the Castello di Buonconsiglio, first floor.

there are "many that lend their virtues to Medicine" as well as "fruit bearing" species "that go well in excellent foods"[31]. However the main image the poem's verses evoke is one of a garden of the senses, a *locus amoenus* in which places, forms, colours, perfumes, tastes and sounds converge to give the visitor an experience of beauty and harmony capable of exciting *recreatione*, wonder and awe. In addition to its entertainment functions, the garden was supposed to engender an eminently spiritual knowledge that went beyond the sensory data pertaining to the naturalist and the agronomist[32].

This also appears to be in keeping with what emerges in the section of the poem that precedes the description of the palace. Here, in fact, we can sense Mattioli adopting the same underlying attitude he took in his commentary on Dioscorides: the enormous importance he attributes to the evocation of spontaneous nature as a garden, incomparably more various and enthralling for anyone able to read its composition. Indeed, Iatra, the "sylvan muse" who accompanies the protagonist identifies "*her own* beautiful garden" (33,1) in the plants and animals that populate the Trentino's mountains. The natural descriptions in octaves 53-72 reinforce our impression that for Mattioli the richness and variety of nature in the Val di Non, exuberant in its productions but nonetheless endowed with a secret order that still needs to be revealed, is more attractive and instructive than the garden arranged in the spaces (however large) of a princely residence. Despite the sincere efforts the courtier made to magnify his prince's refined creations, he could not disguise his preference for a domain he considered to be subject only to the rule of God.

3. *Visual Gardens*

Mattioli's subsequent period in Gorizia, between 1542 and 1555, despite his burdensome medical duties there, allowed him to continue to gather the data he needed to finish, correct and later supplement his critical commentary of Dioscorides[33]. His career reached a turning point in 1555 when he was summoned to the court of Prague by Ferdinand – king of the Romans and a few years later emperor. Mattioli was engaged as physician of the second born son, Ferdinand archduke of Austria[34], but he was also entrusted with "caring for the royal gardens and in particular, those of Queen Anne's Belvedere"[35]. Surviving documents tell us little about his activities there and it is of course possible that new facts will emerge that will make it necessary to reassess them. However, the fact remains that Mattioli's new position at court encouraged him to adopt a new approach to natural history and communication practices[36]. It was during these years, also in the wake of recent improvements in engraving techniques for works of botany and anatomy,[37] that he began to grasp the usefulness of illustrations in scientific books. In fact, the Latin edition of the *Discorsi* appeared in 1554, the first that contained engravings based on the drawings of Giorgio Liberale of Udine.[38]

This development favoured a gradual departure from the rational empiricism of

his youth when he preferred a direct contact with "simples", by means of repeated observations made on site; he was now inclining towards a knowledge that was more functional to the production of books in which the image explicitly substituted real autoptic practice. While during his youthful phase symbolic-literary aspects accompanied and illustrated his field work, later in life verbal and visual codification took on a growing importance as the number of Dioscorides' editions proliferated. It is a trajectory observable in other domains within natural philosophy which have been associated variously with the processes of social and cultural control ushered in by the Counter-Reformation. In Mattioli's case the shift seems to have been mainly linked to dynamics surrounding his professional success and the consolidation of his scientific reputation. Unlike botanists such as Luca Ghini, whose greatness historians today acknowledge notwithstanding the difficulties in reconstructing his career and scientific achievements, Mattioli was quick to understand that publications realized according to specific requirements could not only ensure him cultural preeminence but material benefits as well.

Certainly, samples of plants continued to provide material for his work of cataloguing the vegetable world, but now in an indirect form through an epistolary network that linked him with colleagues like L. Ghini, G. Falloppio, A. Laguna, B. Maranta, U. Aldrovandi, G.O. Melchiori, just to mention the best known. In this tendency to create a virtual paper garden that substituted the garden of nature we can see signs of a methodological withdrawal. However, it must be recognized that Mattioli's particular attention to scientific illustrations was the fruit of a publishing strategy destined to have an enormous impact: it met the needs both of patrons and the book market by creating a product that facilitated an unprecedented spread of botanical knowledge. Nor should we forget that in comparison with any real garden, a book accompanied by quality illustrations had considerable advantages: "We did this" – he wrote in the dedication to the 1559 edition – "in order that those who are unable to travel the world to study simples, or have no experts to show them, may obtain a garden from me in which they can see and become familiar with plants at any time of the year and without any need of cultivation"[39].

Like most of his contemporaries Mattioli attributed a great variety of meanings and functions to the notion of garden[40]. But during the course of his career, the relative importance he ascribed to different types of gardens changed considerably. While he was on the rise professionally, a period that lasted until 1555, the garden interested him exclusively in its vegetable and sensorial form, as a theatre of nature to be directly experienced: this meant the plants that were growing freely on the Alps, but it also meant the disciplined flora of botanical gardens whose importance he appreciated since they provided the living collections he needed for his pharmacological research. Dried herbals and graphic representations seemed to him at that time to be totally inadequate for the purpose of communicating the richness and brilliance of the vegetable world.

During the years of his maturity, as we have seen, nature directly experienced gave way slowly to a concern about improving verbal and visual representations.

As regards Mattioli's frequenting of aristocratic gardens or the gardens of patrons that he had personally helped to create, the sources seem to confirm the hypothesis that throughout his entire career these were only of secondary importance for him. This does not mean that he didn't appreciate their spiritual, aesthetic and social value; besides, as a courtier he was aware that gardens were necessary for the development of botany, if for no other reason than as vehicles of an all pervading fashion that could stimulate patronage. In this sense, Mattioli's case seems to show not so much that botanists were underestimating the demands of the powerful, as that they were engaged primarily in defining their own discipline – which at the professional level translated into the need to create an independent republic of botanists. Mattioli's story suggests that, as early as the third decade of the sixteenth century, an awareness had arisen that the cognitive and therapeutic functions of botanic gardens were distinct from the purpose of entertainment and self-representation that was peculiar to the aristocratic garden. This awareness engendered separate sets of methodologies, individual behaviors and literary output for each of the two areas without, however, preventing knowledge and experiences from circulating between them.

Notes

1 P. Grimal, *L'arte dei giardini. Una breve storia*, Milan, 2014 (1974); A. Tagliolini, *Storia del giardino italiano*, Florence, 1988, pp. 57-109; L. Zangheri, *Storia del giardino e del paesaggio. Il verde nella cultura occidentale*, Florence, 2003, pp. 33-59, 89-95.

2 In this regard let me just mention: *I 400 anni dell'orto botanico di Pisa, proceedings of the International Conference Pisa October 11-13, 1991*, in "Museologia scientifica", 9, 1993; F. Garbari, L. Tongiorgi Tomasi, A. Tosi, *L'Orto botanico di Pisa*, Pisa, 2005, p. 5; *L'Orto botanico di Padova 1545-1995*, edited by A. Minelli,Venice 1995; *Orti botanici: passato, presente, futuro, proceedings of the International Conference Padua, June 29-30, 1995*, in "Museologia scientifica", 14(1), Supplement, 1998. For a broader interpretation see: G. Olmi, *L'inventario del mondo. Catalogazione della natura e luoghi del sapere nella prima età moderna,* Bologna, 1992; B.W. Ogilvie, *The Science of Describing. Natural History in Renaissance Europe,* Chicago and London, 2006.

3 I incline more toward the idea of a common humanistic imprint. Cf. T. Comito, *Il giardino umanistico,* in *L'architettura dei giardini d'Occidente dal Rinascimento al Novecento*, edited by M. Mosser and G. Teyssot, Milan, 1994, pp. 33-40; B. Ogivie, *The Science of Describing* (cit. n. 2), pp. 11-17.

4 Both physicians/botanists, as well as apothecaries and high ranking patrons were able to identify four basic reasons for being interested in cultivating gardens: medical efficacy, decorative value, cognitive and emotional pleasure, social prestige. The relative importance of each motive varied considerably with each group, but only for aristocratic patrons and teachers of "simples" possessing a real garden was an absolute necessity.

5 For Mattioli's biographical profile see: *Pietro Andrea Mattioli, Siena 1501-Trento 1578, La vita e le opere con l'identificazione delle piante*, edited by S. Ferri, Perugia, 1997. An updated bibliography in L. Ciancio, *"Per questa via s'ascende a magior seggio". Pietro Andrea Mattioli e le scienze mediche e naturali alla corte di Bernardo Cles*, in "Studi Trentini di scienze storiche", 94, 2015, pp. 159-184.

6 S. Ferri, *Il "Dioscoride", i "Discorsi", i "Commentarii": gli amici e i nemici,* in *Pietro Andrea Mattioli, Siena 1501 - Trento 1578* (cit. n. 5), pp. 15-48, p. 44 n. 19 (botanizing on the Capitoline hill).

7 In 1544 he recalled that he had had "ample opportunity to note and observe how alum is extracted because of having resided in that place continuously for two years". P.A. Mattioli, *Di Pedacio Dioscoride Anarzabeo libri cinque Della historia, et materia medicinale tradotti in lingua volgare Italiana da M. Pietro Andrea Matthiolo Sanese Medico*, Venice, 1544, hereinafter Mattioli 1544, p. 424A.

8 Tagliolini, *Storia del giardino italiano* (cit. n. 1), pp. 91-93. See also D.R. Coffin, *Gardens and Garden in Papal Rome,* Princeton, 1991.

9 G. Fabiani, *La vita di Pier Andrea Mattioli*, con aggiunte e annotazioni di L. Banchi, Siena, Tipografia dell'Ancora, 1872, pp. 5-6.

10 See at least R. Tisot, *Ricerche sulla vita e sull'epistolario del cardinale Bernardo Cles (1485-1539)*, Trento, 1969; *Bernardo Clesio e il suo tempo*, edited by P. Prodi, Rome, 1988, 2 vols.; G. Rill, "Cles, Bernardo", in *Dizionario biografico degli italiani*, 26, Rome, 1982, pp. 406-412.

11 Some art historians have cast doubt on the attribution of the *Ritratto di botanico* to Alessandro Bonvincino, today in the Palazzo Rosso (Genoa), though the initials A.B., on the wall to the left of the vault, would appear to confirm this. There is still some doubt over the identification of the figure as Pietro Andrea Mattioli, despite its resemblance with other portraits of the naturalist. The date given to the painting (1533) refers to a period when Mattioli was known as a botanist only within a narrow circle. In any case, the painting is interesting not just because of its indisputable quality but also because the botanist is depicted in what looks to be a garden. See: O. Mattirolo, *Pietro Andrea Mattioli nel Ritratto del botanico di Alessandro Bonvicino detto il Moretto da Brescia*, in "Atti e memorie dell'Accademia di storia dell'arte sanitaria", 37, 2, March-April 1939; P.V. Begni Redona, *Alessandro Bonvicino: il Moretto da Brescia*, Brescia, 1988, pp. 260-262; G. Fossaluzza, *Proposte attributive per Paolo Pino ritrattista,* in *Paolo Pino teorico d'arte e artista. Il restauro della pala di Scorzé*, edited by A. Mazza, Treviso, 1992, pp. 91-106; M. Lupo, *Il Magno Palazzo annotato,* in *Il Castello del Buonconsiglio. Percorso nel Magno Palazzo,* edited by E. Castelnuovo, Trento, 1995, pp. 66-231, 69-72; A. Tosi, *Portraits of Men and Ideas: images of science in Italy from the Renaissance to the Nineteenth century*, Pisa, 2007, pp. 31-33.

12 Cf. P.A. Mattioli, *Morbi gallici novum ac utilissimum Opusculum,* in *Liber de morbo gallico in quo diversi celeberrimi in tali materia scribentes*, Venetiis, 1535, *Praefatio*. The publishing history up to that point in J. Stannard, *Dioscorides and Renaissance Materia Medica,* in *Materia Medica*

in the Sixteenth Century, edited by M. Florkin, Oxford, 1966, pp. 1-21; D. Fausti, *Traduzioni cinquecentesche di Dioscoride e prospettiva filologica,* in *Pietro Andrea Mattioli, Siena 1501-Trento 1578* (cit. n. 5), pp. 49-59.

13 Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), *Al Reverendiss. et Illustriss. suo Signore il S. Christophano Madruzzo*. The reference to Fracastoro, Monte and Vesalio suggests he may have been in touch with the Paduan humanists who gave rise to the Accademia degli Infiammati, between 1540 e 1542. On this see, A. Carlino, *Anatomia umanistica. Vesalio, gli Infiammati e le arti del discorso*, in *Interpretare e curare. Medicina e salute nel Rinascimento*, edited by M. Conforti, A. Carlino, A. Clericuzio, Rome, 2013, pp. 77-94, 88.

14 Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 255; Ciancio, "*Per questa via…"* (cit. n. 5), pp. 18-19.

15 C. Raimondi, *Lettere di Pietro Andrea Mattioli a Ulisse Aldrovandi*, in "Bullettino Senese di Storia Patria", 13, fasc. 1-2, 1906, pp. 1-67, 16, remarks repeated on pp. 28 and 58. Ferri, *Il "Dioscoride"* (cit. n. 6), pp. 24-25 and n. 6. S. Toresella, *L'Erbario inedito di P.A. Mattioli,* in "Atti del Congresso Nazionale dell'Accademia Italiana di Storia della Farmacia", Conselve, 1993, pp. 287-295.

16 Ferri, *Il "Dioscoride"* (cit. n. 5), p. 19 e n. 22. In the village of Cles where he resided, he did possess a laboratory in which he prepared medicine and performed distillations. Cf. A. Mosca, *"Ne trovarà assai bon giovamento": una lettera inedita di Pietro Andrea Mattioli a Bernardino di Thun"*, in "Studi Trentini di scienze storiche", 88, 2009, pp. 111-117.

17 On the socio-cultural significance of apothecaries see F. de Vivo, *La farmacia come luogo di cultura: le spezierie di medicine in Italia*, in *Interpretare e curare* (cit. n. 13), pp. 129-142.

18 Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 11B [Parolini], p. 321D [Spezzalancia]. In this passage Mattioli informs us that some plants were sent to him by Pietro Saliceto physician in Graz. G. Conci, *Nel IV centenario della venuta di Pietro Andrea Mattioli nel Trentino: l'opera scientifica del Mattioli e le sue relazioni col Trentino*, in "Studi Trentini di scienze naturali", 9, 1928, I, pp. 34-58, 48-49. Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 199B [Guidottini], p. 252 [Spaicher].

19 Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 46B [botteghe napoletane], p. 100 [Pompeo Colonna].

20 Judging from the number of citations, the physician-apothecary Maffei was Mattioli's main reference person in Venice for questions of pharmacy. See Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), pp. 194, 199, 205, 240, 364. A reference to Maffei's garden in R. De Visiani, *Delle benemerenze de' Veneti nella Botanica*, Venice, 1854, p. 83. On sixteenth century Venetian gardens see: G. Dian, *Cenni storici sulla farmacia veneta al tempo della Repubblica*, Venice, 1900-1908; M. Cunico, *Il giardino veneziano*, Venice, 1989; M.A. Laughran, *Medicating With or Without 'scruples': The 'Professionalization' of the Apothecary in Sixteenth-Century Venice*, in "Pharmacy in History", 45, 3, 2003, pp. 95-107, p. 102; C. Lazzari, *Le ricerche naturalistiche nel territorio veneziano, dalle origini al Settecento,* Venice, 2006, pp. 37-43. On pharmacies as centres of heterodox religious discussion see F. de Vivo, *Pharmacies as centres of communication in early modern Venice*, in "Renaissance Studies", 21, 4, 2007, pp. 505-521.

21 At that time, Ramusio held the very important position of Secretary of the Republic. Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 231.

22 A. Quondam, *Nel giardino del Marcolini, un editore veneziano tra Aretino e Doni*, in "Giornale storico della letteratura italiana", 157, 1980, pp. 75-116.

23 The symbolism is replete with significance both on the politico-religious level as well the aesthetic-literary. On the variety of meanings attributed to the laurel and the palm see A. Cattabiani, *Florario. Miti, leggende e simboli di fiori e piante*, Milan, 1996, pp. 83-90 (palm), pp. 261-267 (laurel). Cf. Mattioli, *Di Pedacio Dioscoride* (cit. n. 7), p. 64. Useful in shedding light on this aspect of Bernardo Cles' culture would be an examination of the landscape, floral and rural motifs in the cycles of paintings commissioned to the Dossi brothers and to Marcello Fogolino for the castle of Buonconsiglio and on the friezes in Castel Stenico. See D. Primerano, *Bernardo Clesio Signore del Rinascimento*, Trento, 1984, pp. 22-23.

24 L. Borrelli, *Ricerche per una ricostruzione della biblioteca del cardinale Bernardo Clesio*, in *La biblioteca del cardinale Bernardo Clesio*, Trento, 1985, pp. 57-173.

25 L. Gabrielli, *Il Magno Palazzo del cardinale Bernardo Cles. Architettura e arti decorative nei documenti di un cantiere rinascimentale (1527-1536),* Trento, 2004, p. 235. The nearest and most influential models were the gardens of Mantua, Ferrara and Pesaro. In addition to Gabrielli, documents relating to the work site have been published in H. Semper, *Il Castello del Buon Consiglio a Trento*, Trento, 1914, and C. Ausserer and G. Gerola, *I documenti clesiani del Buonconsiglio*, Venice, 1924.

26 Anonymous, *Desegno del palazzo di Trento*, floor plan, Vatican city, Archivio Segreto Vaticano, Arm. 72, vol. 77, f. 63, f. 67. In fig. 2, the manuscript plan is the result of the union of two partial plans on two separate pages.

27 For an accurate plan of the castle in its current state see M. Lupo, *Il Magno Palazzo annotato* (cit. n. 11), p. 228.

28 Gabrielli, *Il Magno Palazzo* (cit. n. 25), pp. 239-240. Tagliolini mentions a similar mechanism in the villa in Pratolino. Tagliolini, *Storia del giardino italiano* (cit. n. 1), pp. 160-169.

29 The possibility of an active role taken by Mattioli mainly – it would seem – in choosing Fogolino's iconography is alluded to in E. Castelnuovo and M. di Macco, *Antico già, hor tutto rinnovato,* in *Il Castello del Buonconsiglio. Percorso nel Magno Palazzo* (cit. n. 11), pp. 10-49, 44-45.

30 Gabrielli, *Il Magno Palazzo* (cit. n. 25), pp. 236.

31 Lupo, *Il Magno Palazzo annotato* (cit. n. 11), p. 214.

32 It should be emphasized, however, that early modern physicians paid great attention to the beneficial effects of sensory experience in gardens. See C. Rawcliffe, *'Delectable sightes and fragrant smelles': gardens and health in late medieval and early modern England*, in "Garden History", 36, 1, 2008, pp. 3-21.

33 F. Martini and L. Poldini, *Un medico senese nella Gorizia del Cinquecento,* in *Pietro Andrea Mattioli, Siena 1501 - Trento 1578* (cit. n. 5), pp. 119-130.

34 Fabiani, *La vita* (cit. n. 9), pp. 31-33. Fabiani refers to the archduke's desire to restore natural history by encouraging scholars and acquiring costly items on the collector's market.

35 Zangheri, *Storia del giardino e del paesaggio* (cit. n. 1), p. 63; Ferri, *Il "Dioscoride"* (cit. n. 6), p. 25 and n. 71. See also C. Riedl-Dorn, *Die Grüne Welt der Habsburger*, Vienna, 1989; M.L. Lenzi, *Dal 'Regno di Iatra' alla corte di Praga,* in *Pietro Andrea Mattioli, Siena 1501 - Trento 1578* (cit. n. 5), pp. 83-104.

36 P. Findlen, *The Formation of a Scientific Community: Natural History in Sixteenth-Century Italy,* in *Natural Particulars, Nature and the Disciplines in Renaissance Europe*, edited by A. Grafton and N. Siraisi, Cambridge Mass., 1999, pp. 369-400. I mention this essay because of the valuable hints it provides on the political and confessional implications of natural history during the age of Reform.

37 Dating to 1530-36 the *Herbarum vivae eicones* by Otto Brunfels, to 1542 the *De historia stirpium* di Leonhard Fuchs and to 1543 Andrea Vesalio's *De humani corporis fabrica*, all works Mattioli was well acquainted with.

38 On this fundamental aspect of Mattioli's work see at least L. Tongiorgi Tomasi, *Il problema delle immagini nei 'Commentarii'*, in *Pietro Andrea Mattioli, Siena 1501 Trento 1578* (cit. n. 5), pp. 369-376.

39 P.A. Mattioli, *I discorsi di Pietro Andrea Mattioli*, Venice, 1563, p. 15.

40 If we were to try to identify a set of common features, we might say that Mattioli used the term to indicate a place – even a figurative one – in which objects have been collected whose beauty, variety and order suggest the work of a loving "gardener"; this "place", by virtue of its *amoenitas*, has the ability to stimulate the imagination and conversation among elevated minds.

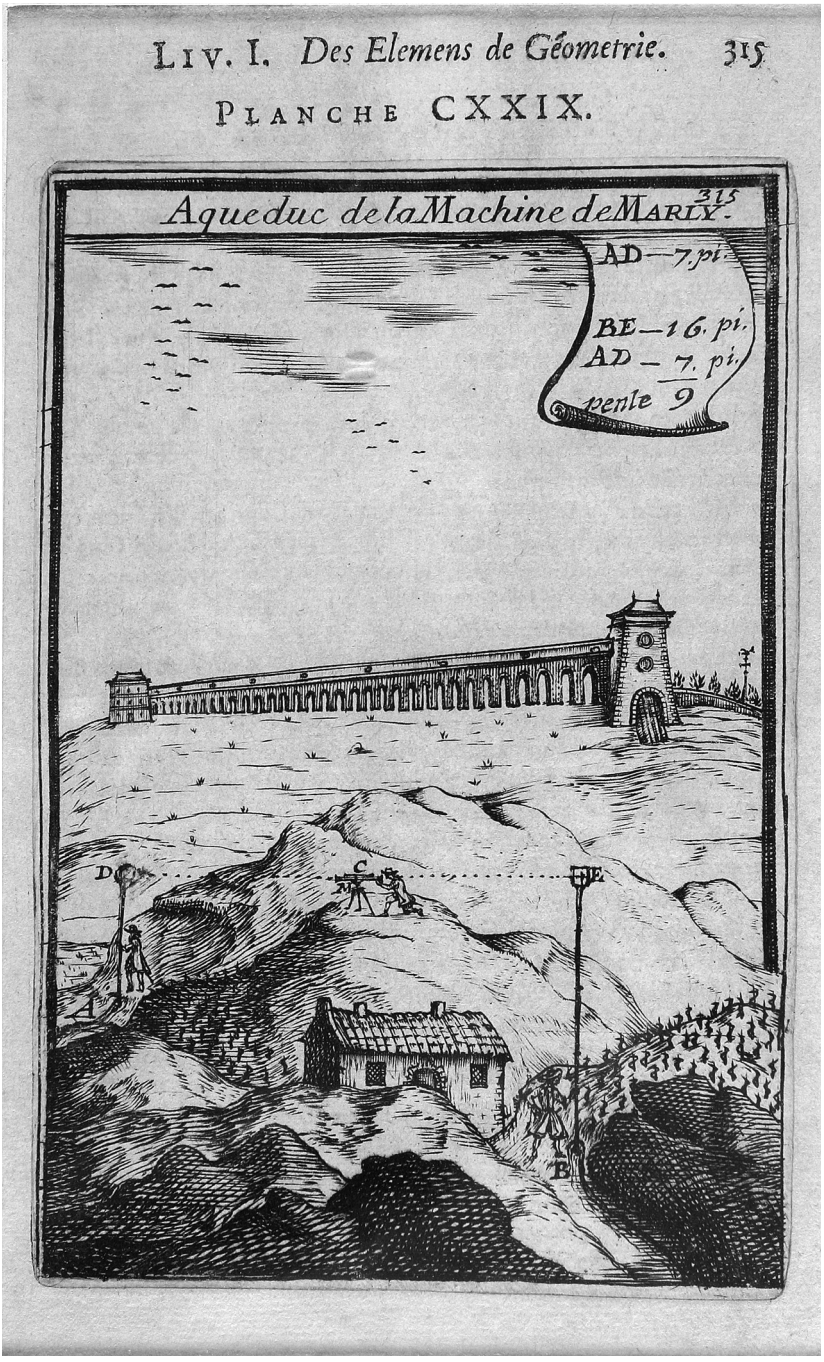


Fig. 1. Alain Menesson-Mallet, *Aqueduct of the Machine de Marly*, in *La géométrie pratique*, Paris, 1702. Here a kneeling engineer using an automatic water level instrument can be seen.

Hydraulics in Horto: levelling between water and power in seventeenth-century gardens in France and Holland

Alette Fleischer*

> The beauty of the waters of Versailles was a display quite new to the world, and every day it became more and more astonishing. It made the Science of Water fashionable; and Mathematics helped to make all things wild useful for the great King's pleasure and magnificence.[1]

The second half of the seventeenth century saw the construction of two important baroque gardens, that of Versailles in France and Palace Het Loo in the Republic. Although the scale is not in the least comparable, both the French King and the Dutch Prince aimed to bedazzle their visitors with the artistic splendours of nature. Vistas, clipped topiary, elegant walkways, costly sculptures, flowers, fruit trees and exotic plants adorned the royal gardens and impressed friends and foreigners alike. An important place in the garden was reserved for water. Canals filled with clear water, ponds mirroring the blue sky, ornate fountains and spouting jets ornamented with classical gods and heroes reflected the regal power and prowess to govern one's country and nature. The cost and effort to create fountains, collect water, construct pipes and control the movement of water was a joint matter that involved numerous parties, including engineers, fountain builders, scholars, and royals. Hydraulics in gardens, thus, formed a field of work for scholars and engineers trying to calculate and calibrate the land to suit a ruler's territorial ambitions.

The "science of water" captured the attention of French engineers and scientists, but also that of two Dutchmen: the mathematician Christian Huygens (1629-1695) and engineer and fountain maker Willem Meester (1653-1701). Christian lived in Paris in the 1670s and 1680s and was paid by the French King Louis XIV (1638-1715) to construct and organise the *Académie Royale des Sciences*. Meester was in the service of stadtholder Prince Willem III (1650-1702), working as engineer to build waterworks and bulwarks. Both patrons, the French King and the Dutch Prince, took great pride in their gardens, especially when it came to water features. Huygens and Meester were keen inquirers of garden hydraulics such as water pumps and milling systems and each tried to accommodate their patron's desire for sumptuous spouting jets and cascades.

To facilitate the construction of fountains and ponds in specific and the mathematics and science of water in general, both the mathematician and the engineer invented an au-

tomatic water level instrument to measure the surrounding landscapes. By calibrating the degree of slopes and elevations, as well as measure the size of terrains, a workforce could build canals and artificial lakes to redirect water from nearby rivers. Via pipes and valves, the force of water managed to create an impressive display of cascades and jets. Huygens and Meester wanted to obtain the attention and appreciation of not only other engineers and mathematicians but also of the Prince of Orange and the King of France. A royally approved instrument allowed for an inventor to improve on social status – amongst peers and princes – and could lead to an increase in income. Thus the two Dutchmen competed directly with each other in regards to whose invention would be considered the most accurate and best to use in the field. Meester and Huygens utilised all available resources (i.e. network and ways of communication) to propagate their instrument.

There could only be one victor, and the victor's success greatly depended on a powerful network and not as much on the usability of the invention itself. Historians Steve Shapin and Simon Schaffer argue in their highly acclaimed book *Leviathan and the air-pump* that "he who has the most, and the most powerful, allies wins"[2]. Huygens had, as this paper will show, the most and the most powerful network of allies. Patronage networks affected not only the livelihood of clients, but also the content and reception of their work and discourse as Mario Biagioli informs in his esteemed book on Galileo Galilei[3]. Patronage, as a type of network, was one of the basic structural components of early modern European society, as historian Lisa Sarasohn argues in her paper "Nicolas-Claude Fabri de Peiresc and the Patronage of the New Science in the Seventeenth Century"[4]. A patronage network relied on loyalty, commitment and convenience between giver and receiver, whereas a network such as the Dutch East India Company depended on paperwork and parcels via which decrees, materials and information could be passed on from Amsterdam to the Company's outposts and back. In my paper on the Company Garden at the Cape of Good Hope[5], I argue that the group with the stronger network is able to control distant territories and win the battle for power and land over the group with less efficient means of communication, i.e. a non-literate network. A dependable network and an efficient way of communicating (via letters, pamphlets, charts, decrees) knowledge and materials to principals, peers or patrons enabled a group or a person to succeed over a rival in order to obtain control over land, commercial or personal success and wealth.

This article argues that the success and authority of an invention is intricately linked to the maker's network and social status. It is shown here that the construction of extravagant hydraulics lays bare the rivalry between Meester and Huygens and their patrons. Having the stronger network enables a mathematician in the service of Louis XIV and member of the *Académie Royale des Sciences* to gain an edge over his competition, a Dutch engineer working for the Dutch Prince but without backing from an association of equal status. The usability of the instrument in the field was of lesser concern. What mattered was the propagation of its qualities by the inventor and his network. The first two sections of this article introduce Willem Meester and his involvement with the

waterworks of the Republic's stadtholder and Christian Huygens and his keen interest in fountains in Holland and France. The third section discusses the various types of water-level instruments, as well as the invention of an automatic levelling instrument by Meester and Huygens followed by a few concluding remarks on the importance of networks in the battle for success.

Princely fountains in the Low Countries

From the 1660s up to 1700, Louis XIV, King of France and the Dutch Willem III, Prince of Orange instigated the construction of formal gardens at their favourite residences. For Louis XIV, the garden of Versailles project was a reflection of his power over nature and France. In the Republic, the gardens of Palace Het Loo near Apeldoorn showcased Willem III as stadtholder of a powerful Republic (from 1672 onwards). Willem's status as stadtholder and from 1689 King of England and Ireland made him a serious rival of the French King. Immediately after Willem's installation as King, Louis XIV began to wage a war against the Republic and England[6]. Following sociologist Chandra Mukerji's argument in her book *Territorial ambitions and the gardens of Versailles*, a royal garden can be considered an alternative battlefield[7]. Ambitious princes and kings saw grand-scale gardening as a way to show their power over nature and their authority over population and country. Gardening entailed the manipulation of nature for the social and political benefit of the garden owner. Visitors experienced the King's territorial claim and social might in an artistic and erudite way.

To further demonstrate one's power was the grand and elegant presentation of waterworks as part of a baroque garden. It could take form in canals and mirror-ponds, lavish fountains, cascades, water jokes and high-spouting jets. Water, especially clear, fresh smelling water, reflected and enhanced the majestic power and prowess to rule nature and land. In order to mould water into the geometric format of a formal garden, it had to be brought in from an outside source, for instance via pipes and canals, into vast basins. Gardeners, engineers, nobles and scholars all busied themselves mentally and physically to redirect water into a garden. The French King and the Dutch Prince and the people around them were interested in the noble art of gardening and specifically in sumptuous hydraulics. Together, they translated their ruler's territorial ambition and display of power into an intricately designed water spectacle.

Willem III of Orange was, like his relatives, keen on gardens. He had inherited the palace at Honselaarsdijk (close to The Hague) with its geometrical garden and waterworks. The Prince conveyed his garden ideas after purchasing the hunting lodges Soestdijk (in Utrecht) in 1674 and Dieren (in Gelderland) four years later. Visitors could admire Willem's gardens of Het Loo (near Apeldoorn) that were finished in 1684. In England, Willem and his wife, Queen Mary (1662-1694), commissioned the gardens of Hampton Court being built in the period 1689 to 1694[8]. In all cases, the stadtholder

had commissioned work on the house and garden, regarding design, ornaments and the construction of water features[9].

On flat terrain, as was the case in the Low Countries, engineers tried to find all kinds of ways to redirect water from a source. Water was pumped up or collected when it rained after which it was stored in a rooftop container or a basin on top of a hill. Placing it at a certain altitude allowed the water pressure to produce a jet. A natural constant flowing source was the best option, since the water was permanently available and fresh. With a closed water circuit, water had to be continuously pumped round. The problem was that after a while the water would become dirty and smelly. A foul fountain was a terrible thing for both the garden owner and his visitors. During his career as *fontainier* for Willem III, it was up to Willem Meester to come up with working solutions.

Willem Meester was first trained as a clock maker. In 1671 he studied in Leiden Duytsche Mathematique. This was a course taught in Dutch that focused on engineering, land surveying and mathematics. In 1673 he entered the State's army as controller of artillery. He was also active as a military engineer, fountain maker and inventor. Meester was in the service of the stadtholder and when the Prince became King of England, the engineer followed Willem of Orange to England. From 1682 to 1692, Meester was in charge of the building of waterworks on two of Willem III estates: Soestdijk and Het Loo.

For the Prince's hunting lodge Soestdijk, Meester designed a tower-like building with a windmill on the north side of the garden. This wind-and-horse mill pumped up water from a little stream into a metal reservoir on the roof of the building. On windless days a horse would set a second wheel in motion. From the reservoir, two pipes brought the water into the fountain and the water pressure caused the water to spring. The cost of this fountain was a stunning 11,047 guilders. Meester constructed another type of spring fountain for a cousin of the stadtholder, Willem Adriaan van Nassau-Odijk (1632-1705). At his lodge in Zeist (Utrecht), rainwater was stored in rooftop containers. Via pipes and valves, water was redirected into the fountain. The jet functioned until the basin was empty[10].

Meester's most prestigious assignment was the construction of the fountains at Palace Het Loo in Apeldoorn. He started this hydraulic project together with *fontainier* Rutger van Cleef, who remained at Het Loo to oversee the building and maintenance of the waterworks. Het Loo's clear water came from natural sources found in the vicinity. The stadtholder specifically purchased this elevated terrain with brooks and streams to supply his fountains. Via an intricate web of earthenware pipes, water was brought to the lower lying terrain of Het Loo.

Visitors were duly impressed by the display of water. In 1696, Edward Southwell remarked that the house did not impress him, but the garden was splendid and it had "Plenty of water, which supplys the Fountains all day long. [The fishpond was] one of the greatest beautys of the Garden; 'tis a pond of an Acre square…". He found the central fountain most remarkable, as it "throws up water 50 foot high; & the beauty of It may be estimated by the charge which some talk of to be near 30,000£"[11].

A few years later, in 1699, physician Walter Harris commented that the waterworks

> *are supplied with a natural conveyance of Water that does constantly run, and is not forc'd up with Engines into great Cisterns;* […] *the Water is always sweet, and there is no need of Commands, or Preparations for a Day or two before, in order to make it run*[12].

The natural slope of the terrain allowed a steady stream of clear water – without the use of windmills, pumps or basins – to flow into the garden and set in motion the various cascades, fountains, jets going up to various heights and other features, such as water jokes.

In October 1678, two months after the peace agreement between France and the Republic was signed at Nijmegen, the Prince of Orange wanted to send Meester to Paris to investigate the French waterworks[13]. The engineer/*fontainier* was to report his findings to the Prince and bring along maps, prints and books of royal gardens. Meester spent the summer of 1679 in Paris and returned to Holland with prints of the King's First Painter Charles le Brun (1619-1690), a map of the Parisian environment, a book on the Pleasure Carrousel of Versailles of 1669 and a description of the Grotto of Versailles, among other things[14]. Whilst in Paris, he regularly visited the Dutch scholar Christian Huygens[15]. They shared one topic in particular: hydraulics. Christian, like the engineer, had a strong curiosity for water pumps, windmills and jets, in short, the science of water. The men most likely discussed various ways to construct water pumps, calibrate terrains and how to build a working fountain.

Christian Huygens' fervour for fountains

Christian Huygens and his family were of lower nobility. Constantijn, the father (1596-1687), was in the service of the stadtholder, as was his namesake son. The younger son, Christian, was a mathematician who became quite well known in Europe with his telescopic studies, as he uncovered the rings of Saturn and discovered its moon Titan. Furthermore, the scholar invented the pendulum clock for which he received international acclaim. The Huygens' owned a townhouse in The Hague, near the States General, the governing body of the Republic. The family possessed a country estate called Hofwijck (Escape from Court) outside The Hague in Voorburg. The house and garden were designed in Dutch renaissance style. The entire family was interested in gardens and gardening. During their travels, the family visited gardens and discussed encountered features such as design, fountains and grottos[16].

In 1666, Christian left Holland and moved to Paris. The King's finance minister Jean-Baptiste Colbert (1619-1683) had requested Huygens to help him with the organisation of the newly founded *Académie Royale des Sciences* in Paris. As the first director of the Academy, Huygens received an allowance and living quarters in the building of the Royal Academy and Library. Furthermore, the mathematician had a chamber in the

royal observatory where he worked. Huygens, as did the other Academicians, depended on the financial support of the Sun King. From the 1680s, due to his poor health, Christian went back to the Low Countries to stay with his aged father. The scholar meant to return to Paris in 1685, but Louis XIV revoked the Edict of Nantes, which made moving back to Catholic France impossible for the Protestant Huygens.

A few years before Christian entered the service of Louis XIV, André le Nôtre (1613-1700), a garden designer, began the construction of the gardens of Versailles in 1661. It took forty years to complete. In 1664, Charles le Brun was commissioned to design various fountains for Versailles. Since the Sun King desired elaborate waterworks, known as *Grandes Eaux*, for his garden, Huygens and other members of the *Académie Royale des Sciences* became involved in the science of water[17]. The members perceived the waterworks of Versailles as "a display quite new to the world, and every day it became more and more astonishing. It made the Science of Water fashionable; and Mathematics helped to make all things wild useful for the great King's pleasure and magnificence"[18]. The science of water utilised mathematics to control the flow of water. This meant that by using surveying instruments and geometry, the wild nature of water could be tamed and transformed into pleasing waterworks. All kinds of hydraulic apparatuses and surveying devices were put to use in order to restrain and redirect water to the canals and fountains in Versailles. This proved to be an enormous and costly project.

Christian corresponded regularly with his two brothers in Holland, Constantijn (1628-1697) and Louis (1631-1699), on the topic of garden hydraulics. The Huygens brothers discussed every type of pump, mill and surveying instrument that enabled a spouting fountain. For example, Christian described to his brothers a certain type of pump and fountain that he saw on 27 April 1668, writing that it was constructed "after the invention of Mr Franchine [a fontainier] which is very beautiful. It is like the one of Mr Colbert, […] and we expect that it will jet the water twice as high and at a constant height"[19]. Christian had made a drawing to further explain the workings of this pump and by which force it operated.

A few years later, as stated in a letter written on 29 October 1671, Christian described the hydraulics in the garden of Château Beaulieu in Viry. He found "the fountains are not up to par, only the capacity of the pumps, which are driven by a wonderful machine built by Mr [Girard] Desargues"[20]. Christian drew a picture of the construction made by the engineer Desargues and advised his brother that this "uncostly" machine may be something for the stadtholder's garden of Honselaarsdijk. If the Prince of Orange was interested "I will make an exact description"[21]. These two letters indicated that not the beauty of the fountain itself was considered interesting but rather the pumping mechanism. After all, the pump was responsible for the flow and force that made water spurt up in the air. Water pumps and the movement of water were an important matter, taken seriously by Dutch and French engineers, peers of the realm, gardeners, constructors, fountain makers, and anybody else who wanted to take part in the pursuit of sumptuous hydraulics.

Much to the annoyance of Louis XIV, the gardens of Versailles did not have easy ac-

cess to a steady stream of fresh water. The terrain was marshy and wet. In the immediate vicinity there were some hills and a few ponds, but these did not supply enough water for the grand array of fountains. Various engineers and members of the Academy came with plans to pump up and channel water via canals and basins to Versailles. Amongst them were the astronomers and mathematicians abbot Jean Picard (1620-1682) and Philippe de La Hire (1640-1718), the brothers Pierre (1608-1680), Claude (1613-1688) and Charles (1628-1703) Perrault, all three engineers/architects in the service of the King, and the French-Italian fountain maker François Francine († 1688). Despite the combined efforts to find and redirect water for Versailles' fountains and ponds, there never seemed to be enough water to set the elaborate displays in motion. The men responsible for setting the waterworks in motion only did so in the presence of the King. By opening and closing various valves and faucets of the basins, the *fontainiers* activated only those fountains visible to the King[22].

The quest for water brought Jean Picard to survey the area between Versailles and the Loire River in 1674. He measured that the level of the Loire was circa 20 meters below the terrain of Versailles. This meant the Loire was unsuitable to serve as a source. Then attention was directed towards another river: the Seine. In 1678, entrepreneur Arnold de Ville (1653-1722) and his constructor Rennequin Sualem (1645-1708), both from Liege (Wallonia), presented their plans to Colbert to build an enormous pump in the Seine. For the gardens of Modave, De Ville's chateau, Sualem had constructed a water pump that in essence was based on pumps used to subtract water from the mines. For Versailles, the two men proposed to build a machine that consisted of 14 water wheels and 221 pumps. This machine would force water from the Seine into reservoirs, after which the water would be pumped over a ridge via a network of pipes, basins and aqueducts into the gardens of Versailles. At its highest point the water was circa 60 meters higher than the level of the Seine and travelled a distance of more than 1200 meters. The Louveciennes basin had a capacity of more than 700,000 m^3 and was 37 metres above the basins of the Palace of Versailles terrace. In June 1684, the King set the machine in motion. The Seine River proved to provide enough water for the Versailles' *Grandes Eaux*[23].

The size of the water jet, constant flow of fresh water and impressive water displays all reflected one's powerful political position. The struggle for power between Louis XIV and Willem III was fought not only on land and at sea, but equally in the garden. In the two royals' wake, various ambitious persons such as Colbert and Huygens, members of the Academy, noblemen, merchants, engineers, artisans, and architects became interested in the science of water, waterworks, pumps, fountains, and hydraulics. It was a way to show loyalty to the monarch and to demonstrate one's skill to control and understand the workings of water. By constructing pumps or surveying instruments, an inventor could obtain royal grants and thus boost one's position in society. Two Dutch inventors of a levelling instrument competed against each other in order to obtain the approval of the King and the *Académie Royale des Sciences*: Christian Huygens and Willem Meester.

Inventing an automatic water-level instrument

At first, the waterworks of Versailles received water from the river Bièvre and various artificial lakes such as Trappes, Bois-d'Arcy, Bois-Robert, Gressets, and Jardy. Later, the *Grandes Eaux* drew water from the Seine River. An intricate network of basins, canals, and aqueducts were constructed to redirect water into the garden. For this enterprise, the area around Versailles had to be measured. The King's engineers translated the paper proposals onto the surrounding fields and slopes. The workforce used surveying instruments in order to find the most convenient way to channel water to the garden. (fig. 1)

For the construction of the Grand Canal, Colbert urged the members of the *Académie Royale des Sciences* to level the terrains around Versailles and propose a new levelling instrument that could measure greater distances and elevations[24]. Moreover, in 1679 the Sun King expressed his wish to have the coasts of his country measured. Louis XIV's desire to control landscape and land was directly connected to the science of water and the invention of a levelling instrument[25]. It was the astronomer and Academician abbot Jean Picard who calculated the terrain for the Grand Canal of Versailles with his own invention. He also presented a new map of France in 1682.

Picard's device was based on a type of "chorobate" used by masons and gardeners. This beam-shaped water level consisted of a wooden frame, and for nearly the whole length of the beam there was a little groove to contain the water. A funnel on top of the beam functioned as a visor. This instrument enabled levels to be found between two points. Picard adapted this instrument with a special visor in which he placed a crosshair and two convex lenses. With this riflescope Picard could measure greater distances more accurately[26]. Engineers and *fontainiers* used a levelling instrument to gauge the slope of the terrain, which enabled them to calculate how to connect a water source via pipes and basins to a fountain and create a high water jet[27]. Using multiple water-levelling instruments, an engineer could even measure the area over a large distance. This method was known as composed levelling[28].

Inventing a water-level instrument for Louis XIV was a prestigious undertaking. Although Picard kept adapting his invention, there was apparently room for improvement as other members of the Academy in subsequent years presented their version of a levelling instrument. The surveying apparatus of the future was the automatic water-level instrument. Here, the axis of the visor did not need to be set as it found its horizon automatically because the contraption rested in a liquid[29]. Between 1677 and 1680, some Academicians like Ole Rømer (1644-1710), Philippe de La Hire and Christian Huygens tried to impress Colbert and the King with their version of an automatic water-level instrument with lenses.

The automatic water-level instrument designed by Huygens was a type of telescope, as the visor had lenses and a horizontal indicator (a hair). It was also adjustable in height. From a pendant the viewer was counterbalanced by a weight hanging in walnut or linseed oil to dampen any vibrations. The instrument was partially streamlined in

order to be less sensitive to the wind.[30] Christian was very pleased with his invention "one cannot wish for an instrument that is more accurate and more convenient, and I claim that there is not another le-vel that works more secure than this one"[31]. In 1679, Huygens presented his invention to the other members of the *Académie Royale des Sciences* and published it in the *Journal des Sçavans* in January 1680[32]. Confidence paired with a good presentation for a knowledgeable audience was an essential step along the way to gain credibility from a network of peers and patrons[33]. (fig. 2)

Fig. 2. Jan Pauw, *Automatic water level instrument*, 1796, Leiden, Museum Boerhaave. This machine was invented by Christian Huygens in 1679.

Christian was not the only Dutchman to present an automatic water-level instrument. The engineer and fountain maker Willem Meester published a pamphlet on his water-level instrument in the second quarter of 1680 in Holland[34]. This pamphlet was written in French, thus he clearly wanted to address an international audience. Meester's instrument consisted of a float made from lightweight copper that rested in a goblet-shaped container filled with water. Running along the middle of this float was a round vertical axis. The axis was made heavy at the bottom and a tube or visor was mounted on top. There were no lenses in the visor, so a surveyor could look through either end. At each end of the tube a horizontal thread could be placed, with little funnels to regulate the visor. Little copper balls helped to level the visor if it was askew and to balance the line of sight. This whole contraption stood on a tripod[35]. To protect the instrument from wind, which would hinder the calibration, Meester advised a shield be made from cloth with a well-polished and transparent window, as not to hinder the survey[36]. (figg. 3 and 4)

It is unclear to whom Meester had sent his pamphlets. In any case, it was Christian's brother Louis who had mailed Meester's brochure on his invention to Paris. Maybe, via the Huygens brothers, the engineer hoped to get the attention of the *Académie*, Colbert or even the French King. Meester may have counted on Christian's assistance by promoting this invention to a distant and distinguished audience. However, the mathema-

Description d'un Niveau nouvellement inventé,

Qui dans l'usage rapporte ses certaines preuves, ainsi qu'il se peut voir plus clairement de la demonstration, & par lequel l'on peut niveler promptement & parfaitement touts les objects, que la veüe peut atteindre sur tout le tour de l'Horisont & qui de l'œil sont veritablement Niveaux.

PAR

GUILEAUME MEESTER,

Controlleur-General de l'Artillerie des Provinces Unies.

Figure 1.

LA premiere Figure est une forme vuide, platte, & ronde à l'espreuve de l'eau, de cuivre legere, large environ de dix poulces de Diametre; & de quatre en hauteur marquée par les lettres *h h. h h.* par le milieu du fond, & le couvercle de ladite forme passe un tuyau ronde de cuivre de l'espesseur d'une demy poulce environ marqué *i i. S.* long d'un pied & de huict poulces; le bout de dessus marqué *i.* passe le couvercle de trois poulces, lequel bout du dessus doit estre fabriqué aussi rond & uni, qu'il est possible; au bout du dessous dudit tuyau est soudé un poids rond de plomb, marqué *S.* d'une telle pesanteur, que si l'on met la forme vuide dans l'eau, le couvercle de dessus se soutienne environ d'une poulce par dessus l'eau, ainsi que le tuyeau a mirer marquée *L. L.* estante joincte sur le bout de tuyau de cuivre enfonce la susdite forme vuide presque d'une demy poulce, pour cet effet il y a un creux rond au milieu du desous dudit tuyau amirer marquée par les lettre *K.*, qui couvr & ferme le bout de dessous du tuyau de cuivre marqué *i.* d'une telle maniere pourtant, que l'on puisse aisement oster & remettre le tuyau à mirer, le tuyau susdit de cuivre avec la forme vuide doit estre fait d'une pesanteur aussi esguale, qu'il se peut practiquer.

Figure 2.

LA deuxiesme Figure ayante de peu prez la forme d'un calice, monstre la façon de laquelle la premiere Figure se soutient dans l'eau en dedans de la quatriesme ou deuxiesme Fig: marqué avec cinque W. & sont pour cette fin toute deux coupées en profil, ou il se voit aussi, de qu'elle maniere est faite en haut, le tuyau a mirer marqué L L. & le poids au bout d'enbas du tuyau de cuivre, qui passe la forme vuide *h h. h h.* ledit calice est pareillement à l'espreuve de l'eau de cuivre legere.

Figure 3.

LA troisiesme Figure, est une piece de bois triangulaire platte, de l'espesseur d'une poulce large d'un pied & demi de chaque costè, au milieu de cette piece de bois il y a un trous en vise pour y faire entrer le baston (marqué *c. c.* dans la sixiesme Figure) d'enbas de ladite piece de bois platte, elle est faite avec une espece de vise pour estre plus facilement transportée, comme aussi pour pouvoir dresser ce niveau sans l'aide d'une perche ou pied. Le Trepied marqué *e. e.* qui à l'usage se met sur la susdite piece de bois, peut estre de fer ou de cuivre, a dans chaque pied un trou en vise, ou les trois vises tournent, ce qui se voit plus clairement dans la quatriesme & sixiesme Figure marquées par *e. e. e.* notez, que les dites vises doivent avoir les poincts d'enbas bien aigües, pour que le trepied estans mis sur la piece de bois triangulaire, lors qu'on s'en sers, ne puisse glisser; l'usage des vises est, afin de lever ou lacher le calice du costé, ou il pourroit estre trop haut ou trop bas; au milieu du dessus du trepied, il y a une vise, de l'espesseur d'une demy poulce, & passe environ d'une poulce pour entrer au trou en vise, qui est au milieu du fond dudit calice creux marqué U. dans la deuxiesme Figure.

Figure 4.

PAr la quatriesme Figure l'on voit le niveau droict en face, & l'on s'en peut servir, de la maniere qu'il y est representé, sans le mettre sur un pied, pourveu que le fond n'aye poinct plus d'inesgualité, qu'on ne la puisse aider par le moyen des vises, a celle fin que la forme vuide & le tuyau de cuivre avec son plomb, qui la passe, ne vienne a toucher le dedans du calice, comme il se peut voir a la deuxiesme Figure, pour ce sujet en cas qu'il y Resta quelque difference, que le calice ne fut pas bien placé ledit calice a eau est en son Diametre plus large de deux poulce, que la forme vuide.

Figure 5.

LA cinquiesme Figure represent le couvercle, qui s'entreferme avec la forme vuide moyennant un bord ayant au milieu un trou quarrè; le bout d'enhaut du tuyau de cuivre dans la premiere Figure marqué *i.* est d'une espesseure esgual de haut en bas, & le dit trou doit estre si large, que le tuyau de cuivre y puisse tourner librement, pour quel effect aussi le susdit trou est quarré: La Figure marquée par la lettre *P.* se voit mieux dans la Figure precedente & dans la sixiesme, elle a en haut la forme d'une fourchette & en bas un pied, lequel doit estre si pesant & si large, pour qu'estant placé par dessus le couvercle, il s'y puisse tenir de soy mesme ferme & immobile, servante cette Figure seulement pour fixer le tuyau à mirer, pendant qu'on veut niveler les objects, que l'on s'est proposé; mais pour plus grande seureté l'on pourroit, contre les mouvement du vent placer un guarde vent de drap ou autre espece du costè d'ou il vient & le pourvoir d'un vitre bien poli & transparant, & en cas que le vent donna du costè de l'object du niveau, il ne puisse porter obstacle a niveler, il seroit plus a propos de placer tout a tour du niveau une machine qui fut couvert d'en haut, afin d'eviter le vent pourveu que l'on y fit une ouverture necessaire à l'usage.

Figure 6.

PAr la sixiesme Figure le niveau est representé tout achevé ainsi qu'il doit servir, dont le bas bout marqué *a. a.* est une perche ou pied creux, fourni d'une bande de fer, ayant d'un costé une vise marqué *b.* qui passe par l'espesseur dans le creux de ladite perche, dans le creux de laquelle l'on enfonce un baston marquée *c c.* lequel se tenant ferme dans un trou en vise au milieu dela piece de bois platte & triangulaire, peut estre haussé & baissé dans le creux de la perche, & fixé par le moyen de la vise *b.* a la hauteur qu'on souhait, par les lettres *e. e. e.* est representé le trepied, lequel parle milieu est attaché avec une vise au fond du calice vuide ayant a chaque bout de pied une vise marqué *e e e.* pour lever le costé du calicé, qui par le panchant de la perche pourroit estre trop bas, les lettres *g g. ff. r r.* monstrent tout le calice, *h h.* le couvercle d'iceluy, *i.* le tuyau rond de cuivre, lequel par le trou quarré passe de trois poulces environ par dessus le couvercle, P. monstre la fourchette, laquelle arreste le tuyau a mirer, pendant qu'on est à niveler: Par les lettres L L. est representé le tuyau à mirer, *m m.* monstrent quatre petits trous, à travers desquels on attache deux petites filets, qui servent de pinnules, par *n. n.* il paroit deux petits gobelets de cuivre pour mettre quelque poid dans celuy ou le bout du tuyau à mirer sera jugé trop esllevè: K. monstre le petit Canal creux, qui couvre le bout du tuyau de cuivre, passant la forme vuide: La lettre O. fait voir un autre tuyau, dont la partie estroite se met un peu dans le tuyau à mirer, mais la partie grosse s'approche de l'œuil, lors qu'on reguard a travers du tuyau a mirer pour niveler; quelle soit l'utilité de ce dernier tuyau, on la remet au jugement de ceux qui s'en serviront.

Comme on n'est pas obligé a la grandeur ou proportion de la mesure de toute l'ouvrage ou de chaque partie d'icelle, elle n'est pas icy marquée, cependant le tuyeau a mirer fabriqué de cuivre legere est icy forme de la longueur de deux pied, & d'autant plus que cet Instrument sera grand, plus promptement & plus parfaitement pourra-il estre dressé.

Description de la preuve qui se peut tirer, pour estre asseuré de la parfection de ce Niveau nouvellement inventé.

APpliquez le tuyeau a mirer, tellement qu'il se pourroit enfoncer de soy mesme sur le bout de tuyau de cuivre, qui passe par dessus le couverde, & que l'un des bours dudit tuyau a mirer, soit tourné du costé que l'on a dessein de niveler, & si l'on trouve, que lors qu'on mire par le trou de l'autre costé, lequel est tourné vers l'œil le plus bas marquè 3. que les deux filets ensemble marquent du costé de l'object, le poinct de dessus, aussi marqué 3. Il faut, que l'autre bout du tuyeau a mirer, lequel estoit premierement esloigné de l'œil, soit tourné vers l'œil, & qu'on mire avec le petit œil de dessus marqué 2. par le dit tuyau a mirer, lesquels filets marqueront la lettre la plus basse 2. laquelle fera connoistre la difference de l'hauteur, de sorte que faisant passer un perpendiculair du poinct d'en haut marqué 3. par le poinct le plus bas marqué 2. & diviser ladite perpendiculaire en deux parties esguales, ce qui fera le poinct marqué 1. il faut, qu'en suite l'on met autant de poid dans le gobelet marqué N. ou le filet a esté trouvé le plus haut, jusqu'a ce que le poinct de l'object de l'œil du milieu se vienne a marquer, & s'arreste en tournant sur le mème poinct de l'object marqué 1. Le tuyeau à mirer estant ainsi remis en son lieu, il suit necessairement qu'en tournant ledit tuyeau, touts les poincts, que les filets marquent, soient ensemble veritablement horisontales.

Demonstration.

LA ligne de l'œil marquée 1. 1. divise la ligne perpendiculaire marquée 3. & 2. en deux parties esguales au poinct 1. & se connoit par les trois lignes de l'œil grand, lesquelles tirent vers les trois poinct du perpendiculaire marqué 3. 1. 2. Ces mesmes lignes designent en suite deux triangles esguaux, dont-il s'en suit, que les deux coins composes par la ligne de l'œil grand 1. 1. & par la ligne perpendiculaire marquez 3. & 2. sont deux coins esguaux, donc il s'en suit, que la ligne trouvée, marquée 1. 1. est la ligne veritablement horisontale, ce qu'il falloit demonstrer.

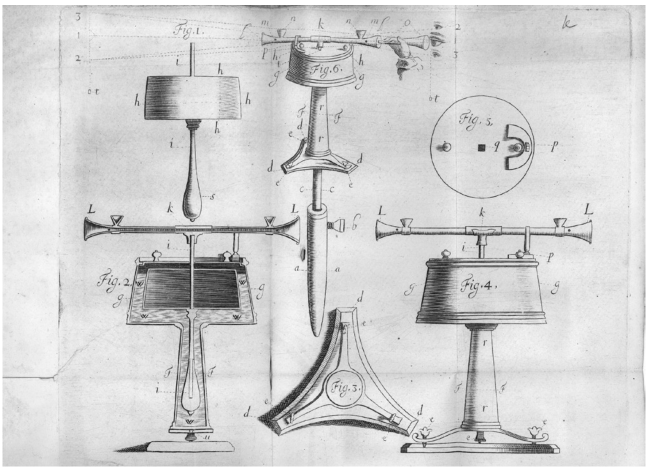


Fig.3-4. Willem Meester, *Description d'un Niveau nouvellement inventé*, c. 1680. Delft, TU Delft Library.

tician was not a willing supporter. On 25 September 1680, Christian wrote to his brother that he was not impressed with Meester's invention as the visors lacked lenses. For Huygens lenses were crucial to make accurate measurements. The fact that the viewer could turn around was not an invention, as it was already known, concluded Huygens[37]. Engineer and historian H.C. Pouls argues that Meester had in fact invented a robust instrument suitable for working in the field, which could have been very useful whilst building fortifications[38]. There is no indication that Meester had made more than one version of his invention[39].

As a member of the *Académie Royale des Sciences* and being close to the King and Colbert, Huygens promoted his invention to a powerful group of people. Their positive reaction enabled the mathematician to have his instrument produced and used. Fellow Academician Philippe de La Hire wrote to Christian, who lived in Holland at that time, that his automatic levelling instrument was very much *en vogue* in France in 1686[40]. Moreover, in 1724, a description of Huygens's instrument was translated into English[41]. Due to his position in the French academic society and his proximity to notably Colbert, Huygens' instrument reached a much wider audience than that of Meester.

Meester's network was not as strong and powerful as Christian's. Although the Dutch engineer was in the service of the powerful Willem III and he was an acquaintance of the Huygens family, his invention failed to become a success. The fact that the engineer was knowledgeable of the recent developments in France regarding this type of device did not benefit him. In fact, Huygens scorned the Dutchman that he had more or less copied Christian's invention, saying that "one can see that Meester has benefited somehow from my invention; but what it produces is yet worth nothing, because his

level has no sighting telescope"[42]. The fact that Christian's instrument had a telescopic lens made the instrument appear to be more accurate when calibrating long distances. The mathematician down played his opponent's automatic water-level instrument by propagating that it was cruder and less reliable when calculating slopes and terrains.

Huygens had a powerful and large network of nobles and scholars, including a mighty politician, who all would vouch for Christian's device. Moreover, the mathematician had established credibility amongst his fellow Academicians even before this invention. Meester, however, came from a humbler background, even though he was in the service of Prince Willem III. He was an engineer considered to be more in the league of craftsmen, unlike Huygens who was a scholar and a mental rather than a manual worker[43]. The fight over fountains and fresh water between the King and Prince became a fight over an instrument between a mathematician and an engineer. Louis XIV wanted to win this battle and claim to have the most sumptuous hydraulics. French hydraulics triumphed but at a high financial cost, while the fountain in the garden of Palace Het Loo continued to produce a constantly flowing sweet smelling spout of water, 50 feet high.

Conclusion

The story of inventing an automatic water-level instrument reveals how beneficial it is to have a powerful network, as well as a certain social and learned position in society. Equally, it is argued here that two of the most important rulers of the time – the French King and the Dutch Prince – displayed their power over nature and their people took the shape of a garden's waterworks. The Academician and nobleman Huygens prevailed in promoting his instrument as better and more accurate than others, especially Meester's. Apparently Christian's automatic water-level instrument seemed quite successful in France and England. This is not because the device was a better invention, but because of his position in royal and academic society in France.

Louis XIV projected his control over his land and nature onto his garden and the *Grandes Eaux* of Versailles. Equally, the members of the *Académie Royale des Sciences* took a serious interest in hydraulics, pumps and land surveying instruments. The King's ambitions led the way for the Academicians to turn savage water into magnificent waterworks by using the laws of geometry and mathematical devices. Inventing for Versailles was key here, as this made hydraulics socially and intellectually acceptable and profitable for scholars. Grand waterworks and fountains became credible as the "science of waters". Hydraulics shifted from the field of engineering into the field of mathematics.

Both Huygens and Meester had to level between water and patron, controlling the one and satisfying the other, while trying to gain the upper hand. The main difference, though, was the strength in their network and social position. Christian's circle of Kings, noblemen, politicians, and scholars, both in France and Holland, made his network much stronger than that of Willem Meester. Christian could easily belittle Meester's

invention to his colleagues at the Academy, to Colbert, to the French King, and to his influential family members in The Hague, who were very close to the Prince of Orange. The invention of the engineer was bound to fail not only because of his social rank or the fact that he was considered a manual worker, but because Christian used his reputation as a mathematician and philosopher, as well as his extensive network to propagate his invention. This tipped the balance in his favour, resulting in Meester's automatic water-level instrument to remain obscure and unknown. Huygens was the victor.

Notes

* I thank the participants of the conference for their remarks, and a special thanks to Professor Bernard Aikema and Dr. Juliette Ferdinand. I am very grateful to Jessica Lipowski for editing my paper.

1 *Histoire de l'Académie royale des sciences*, 1665-99, 11 vols, Paris, 1733, I, p. 260. "Les Eaux de Versailles, dont la beauté étoit un spectacle tout nouveau dans le monde, & qui devenoient encore tous les jours plus surprenantes, avoient mis en vogue la Science des Eaux; & les Mathématiques, toutes sauvages qu'elles paroissent se rendoient utiles aux plaisirs & à la magnificence d'un grand Roi".

2 S. Shapin and S. Schaffer, *Leviathan and the air-pump; Hobbes, Boyle, and the experimental life*, Princeton, 1989, p. 342.

3 M. Biagioli, *Galileo's Instruments of Credit: Telescopes, Images, Secrecy*, Chicago, 2006.

4 L.T. Sarasohn, *Nicolas-Claude Fabri de Peiresc and the Patronage of the New Science in the Seventeenth Century*, in "Isis", 84, 1993, pp. 70-90.

5 A.A. Fleischer, *Trading Places: (ex)changing nature and knowledge at Cape of Good Hope, circa 1652-1700*, in *Centres and cycles of accumulation in and around the Netherlands during the early modern period*, edited by L.L. Roberts, Münster, 2011, pp. 110-127.

6 In his attempts to gain power, the French king invaded the Republic a few times, hoping to weaken the Dutch mercantile and maritime position. The war of 1672–78 was the first Dutch war of Louis XIV. It ended in the Treaty of Nijmegen. In 1688 began the War of the Grand Alliance (also known as the Nine-Years-War) ended in the Treaty of Rijswijk in September-October 1697. With this Treaty Louis XIV acknowledge Prince Willem of Orange to be the lawful king of England.

7 C. Mukerji, *Territorial ambitions and the gardens of Versailles*, Cambridge (MA), 1997.

8 A sample of the appreciation of Dutch gardens by foreign travellers see for instance: *The Papers of Thomas Bowrey 1669-1713*, edited by R. Carnac Temple, London, 1927; W. Harris, *A Description of the King's Royal Palace and Gardens at Loo, together with a short account of Holland*, London, 1699; E. de Jong, *For Profit and Ornament: The Function and Meaning of Dutch Garden Art in the Period of William and Mary, 1650-1702,* in *The Dutch Garden in the Seventeenth Century*, edited by. J. Dixon Hunt, Washington DC, 1990, pp. 13-48; V. Bezemer Sellers, *Courtly Gardens in Holland 1600-1650; The House of Orange and the Hortus Batavus,* Amsterdam/Woodbridge, 2001; C.D. van Strien, *British Travellers in Holland during the Stuart Period*, Amsterdam, 1989; K. Fremantle, *A visit to the United Provinces and Cleves in the time of William III; Described in Edward Southwell's Journal*, in "Nederlands Kunsthistorisch Jaarboek", 21, 1970, pp. 39-68.

9 K.H.D. Haley, *William III as Builder of Het Loo*, in *The Dutch Garden in the Seventeenth Century*, edited by J. Dixon Hunt, Washington D.C., 1990, pp. 3-11.

10 S. van Raaij, P. Spies, *In het gevolg van Willem III en Mary, Huizen en tuinen uit hun tijd*, Amsterdam, 1988. p. 64.

11 Fremantle, *A visit to the United Provinces* (cit. n. 7), p. 52.

12 Harris, *A Description of the King's Royal Palace* (cit. n. 7), p. 24.

13 C. Huygens, *Œuvres complètes de Christiaan Huygens*, Den Haag, 1888-1950, 22 vols. (from here on: OC) vol. 8, no. 2144, Constantijn Huygens to Christiaan Huygens, 27 October 1678, The Hague "Son Altesse fait aller Willem Meester avec Odyc pour s'informer des inventions qui sont en usage pour les fontaines par de la". Odyc is Willem Adriaan van Nassau-Odijk, the cousin of the stadtholder, and owner of Zeist.

14 OC vol. 8 no. 2195, Philips Doublet to Christiaan Huygens, 19 September 1679 The Hague. "…par le Sr. Meester un assez gros pacquet et Rouleau de vostre part contenant une partie des Estampes du Roij, a sçavoir cinq grandes piece de Monrs. Le Brun, la carte des Environs de Paris, la Planche des Machines pour les deux pierres du fronton de louvre, et les livres du Carouzel des Plaisirs de Versaille de l'année 1669 […] aussi la Description de la Grotte de Versaille".

15 OC vol. 8 no. 2178, Christiaan to Constantijn, 22 June 1679, Paris. "Meester est icy depuis quelques jours et me vient voir souvent".

16 For more in the Huygens family: A.A. Fleischer, *Into the Light: constructors and examiners of nature and a Dutch 17th century garden grotto*, "History of Technology", 29, 2009, pp. 113-139; H.J.M. Bos, *Christiaan Huygens - a biographical sketch*, in *Studies on Christiaan Huygens; Invited Papers from the Symposium on the Life and Work of Christiaan Huygens, Amsterdam, 22-25 August 1979*, edited by H.J.M. Bos, M.J.S. Rudwick et. al. Lisse, 1980, pp. 7-16; T. van Strien and K. van der Leer, *Hofwijck: het gedicht en de buitenplaats van Constantijn Huygens*, Zutphen, 2002.

17 R. Briggs, *The Académie Royale des Sciences and*

the Pursuit of Utility, in "Past and Present", 131, 1991, pp. 38-88. Briggs argues that the A.R.d.S. is involved with applied science, as its members are busy with "practical advantage" and "utility" as they invented machines and instruments in order to safeguard royal patronage.

18 *Histoire de l'Académie* (cit. n. 1), vol. I, pp. 260-261. "Les Eaux de Versailles, dont la beauté étoit un spectacle tout nouveau dans le monde, & qui devenoient encore tous les jours plus surprenantes, avoient mis en vogue la Science des Eaux; & les Mathématiques, toutes sauvages qu'elles paroissent se rendoient utiles aux plaisirs & à la magnificence d'un grand Roi".

19 OC vol. 6, no. 1637, 27 April 1668 to Louis Huygens.

20 OC vol. 7, no. 1850, 29 October 1671 to Louis Huygens. Desargues was an engineer and mathematician, known for his work on geometrics and perspectives.

21 OC vol. 7, no. 1850, 29 October 1671 to Louis Huygens.

22 E. Soullard, *Les eaux de Versailles sous Louis XIV*, in "Hypothèses", 1, 1997, pp. 105-112. URL: www.cairn.info/revue-hypotheses-1997-1-page-105.htm. M. Kasser, *Picard et le renouvellement de l'art du nivellement à la fin du XVII^e siècle*, in *Jean Picard et les Débuts de l'Astronomie de Précision*, edited by G. Picolet, Paris, 1987, pp. 266-273.

23 See for more on the Machine de Marly: *Les Maîtres de l'Eau, d'Archimède à la machine de Marly*, Musée Promenade, Marly-le-Roi/Louveciennes, Versailles, 2006; H. Loriferne, *L'influence de Picard dans les Travaux d'Alimentation en eau du Château de Versailles sous Louis XIV*, in *Jean Picard et les Débuts de l'Astronomie de Précision*, edited by G. Picolet, Paris, 1987, pp. 275-311; T. Brandstetter, *The Most Wonderful Piece of Machinery the World Can Boast of: The Water-works at Marly, 1680-1830*, in "History and Technology", 21, 2005, pp. 205-220.

24 A.-J. Dezallier d'Argenville, *La Théorie et la Pratique du Jardinage*, Paris, 1709 [2003], p. 448 "Niveler n'est autre chose que trouver avec un instrument deux points également distans du centre de la terre, et l'objet du nivellement est de sçavoir précisément combien un endroit est élevé ou abaissé au-dessus de la superficie de la terre" and C. Perrault, *Mémoires de ma Vie*, edited by Paul Bonnefon, Paris, 1909, pp. 106, 115; H. Vérin, *Technology in the Park: Engineers and Gardeners in Seventeenth-Century France*, in *The Architecture of Western Gardens; A Design History from the Renaissance to the Present Day*, edited by M. Mosser and G. Teyssot, Cambridge, 1991, pp. 135-146; Loriferne, *L'influence de Picard* (cit. n. 23), pp. 275-311.

25 C. Mukerji, *Territorial ambitions and the gardens of Versailles*, Cambridge (MA), 1997, pp. 263-264. Geometry and its instruments was used to build both Louis XIV's land and garden for royal, military and pleasant reasons. E. S. Saunders, *Louis XIV: Patron of Science and Technology*, in "Libraries Research Publications", paper 46, 1984, http://docs.lip.purdue.edu/lib_research/46 accessed 15 March 2014.

26 See also: Loriferne, *L'influence de Picard* (cit. n. 20), pp. 275-311; M. Kasser, *Picard et le renouvellement de l'art du nivellement à la fin du XVII^e siècle*, in *Jean Picard et les débuts de l'astronomie de précision au XVII^e siècle*, Paris, 1987, pp. 265-273; Vérin, *Technology in the Park* (cit. n. 24), pp. 139-140.

27 Dezallier d'Argenville, *La Théorie et la Pratique du Jardinage* (cit. n. 24), p. 448.

28 Idem, p. 453, "Niveler un terrein de six cens cinquante toises de longueur sur neuf pieds de pente, ce qui s'appelle un nivellement composé. Soit à mesurer en plusieurs stations une grande distance, telle que celle de la montagne A en B avec le sujettion de commencer à l'extrêmité A; choisissez le chemin le plus commode et le moins inégal d'A en B; établissez le niveau au point A, et dirigez-le vers B où il sera bon de planter un jalon pour faciliter l'alignement".

29 Kasser, *Picard et le renouvellement de l'art* (cit. n. 26), p. 270.

30 H.C. Pouls, *Nederlands fabrikaat, het automatische waterpasinstrument van Willem Meester (ca. 1685)*, in *Geodesia*, 27, 1985, pp. 48-50; M. Kasser, *Picard et le renouvellement de l'art du nivellement à la fin du XVII^e siècle*, in *Jean Picard et les débuts de l'astronomie de précision au XVII^e siècle*, Paris, 1987, pp. 265-273.

31 OC vol. 8, no. 2217, to Louis Huygens, 1 Mars 1680, "Il ne se peut rien souhaitter de plus exact ni de plus commode, et je prétens mesme qu'il n'y a point d'autre niveau dont on se puisse servir avec seuretè que cettuycy".

32 *Académie Royale des Sciences Procès-verbaux* 9, 1679 and OC vol. 8, no. 2212.

33 See for more on gaining credibility and audiences: Shapin and Schaffer, *Leviathan and the air-pump* (cit. n. 2); A.G. Gross, J.E. Harmon, M.S. Reidy, *Argument and 17^th^-Century Science: A Rhetorical Analysis with Sociological Implications*, in

"Social Studies of Science", 30, 2000, pp. 371-396; A. Johns, *Identity, Practice, and Trust in Early Modern Natural Philosophy*, in "The Historical Journal", 42, 1999, pp. 1125-1145; J. Tribby, *Cooking (with) Clio and Cleo: Eloquence and Experiment in Seventeenth-Century Florence*, in "Journal of the History of Ideas", 52, 1991, pp. 417-439, Tribby discusses the role of eloquent speech and civil conversation regarding the establishment of credibility.

34 Pouls, *Nederlands fabrikaat* (cit. n. 30). Pouls dates this instrument circa 1685. A letter from Christian to his brother Louis of 1680 indicates otherwise.

35 Willem Meester's pamphlet *Description d'un Niveau nouvellement inventé*, s.l., s.d. "…pour qu'estant placé par-dessus le couvercle, il s'y puisse tenir de soy mesme ferme & immobile, servante cette Figure seulement pour fixer le tuyau à mirer, pendant qu'on veut niveler les objects…" and Pouls, "Nederlands fabrikaat" (cit. n. 27).

36 Idem: Meester "(…) mais pour plus grande seureté l'on pourroit, contre les mouvement du vent placer un guarde vent de drap ou autre especc du costè d'où il vient & le pourvoir d'un vitre bien poli & transparant, & en cas que le vent donna du costé de l'object du niveau, il ne puisse porter obstacle a niveler, il seroit plus a propos de placer tout a tour du niveau une machine qui fut couvert d'en haut, afin d'eviter le vent pourveu que l'on y fit une ouverture necessaire à l'usage".

37 OC vol. 8, no. 2228 to Louis Huygens, 25 September 1680 Viry. "Je vous remercie de l'imprimé de Meester. Son invention est tres peu de chose, puis qu'il n'y a point de lunette d'approche a son niveau. Une croix suspendue comme la miene, mais sans lunette, et n'ayant que deux filets pour pinnules pourroit faire le mesme effect qu'il obtient avec tant de machine. Et ce renversement qu'il pratique de tourner le tuyau bout pour bout estoit desia fort connu, mais ce dont il estoit question c'estoit d'adjouster la lunette d'approche au niveau qui par ce moyen acquiert 20 ou 30 fois plus d'exactitude qu'autrement".

38 Pouls, *Nederlands fabrikaat* (cit. n. 30).

39 OC vol. 9, no. 2408, Constantijn to Christian, "Meester est icy avec son niveau dont il dit qu'il se sert maintenant avec beaucoup de facilité apres l'avoir mis dans une petite tente faite pour cela expres qui l'empesche d'estre remuée par le vent".

40 OC vol 9, no. 2447, Ph. de La Hire to Christian, 6 December 1686. "Vostre niveau est celuy de tous les niveaux qui est le plus en vogue et ie croy que ce que vous voudrez bien nous donner la dessus sera toujours tres bien receu".

41 Pouls, *Nederlands fabrikaat* (cit. n. 30).

42 OC vol. 9, no. 2408, Christian to Constantijn, 24 October 1680, "Car on peut bien voir que Meester a profité en quelque sorte de mon invention; mais ce qu'il a produit ne vaut pourtant rien, parce que son niveau n'a point de lunette d'approche".

43 F.J. Dijksterhuis, *Constructive Thinking. A Case for Dioptrics*, in *The Mindful Hand: Inquiry and Invention from the Late Renaissance to Early Industrialisation*, edited by L.L. Roberts, P. Dear and S. Schaffer, Amsterdam, 2007, pp. 59-82. Dijksterhuis shows that an engineer was considered a lower rank, p. 59.

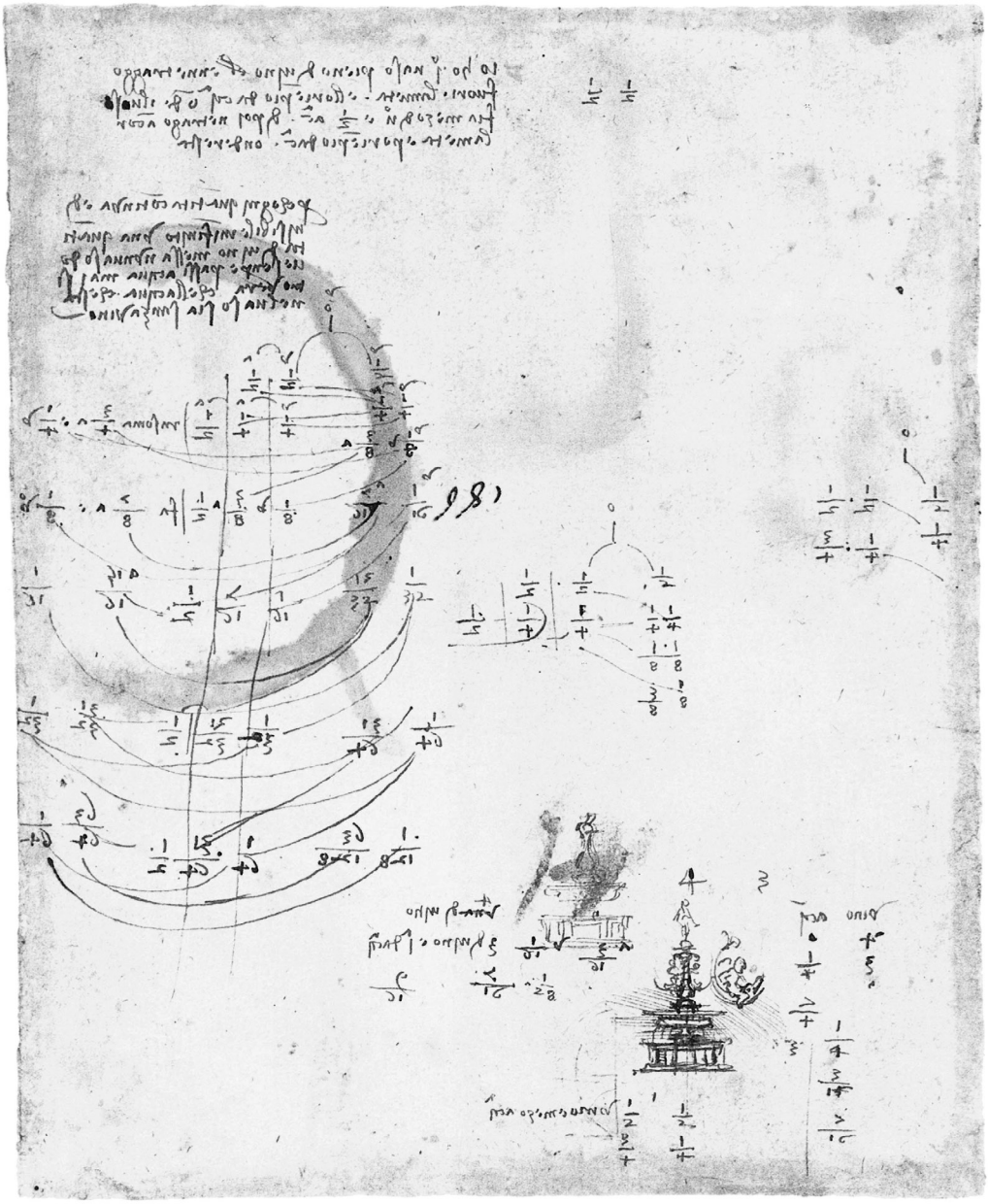


Fig. 1. *Studi per una fontana da vino con calcoli*, c. 1499-1500, in *Codice Atlantico*, f. 218r-b [585r], Milano, Biblioteca Ambrosiana.

Facciasi fonti in ciascuna piazza.
Congegni idraulici e fontane di Leonardo per i committenti francesi

Sara Taglialagamba*

Il 1506 vede la nascita dello stretto sodalizio tra Leonardo da Vinci e i committenti francesi, prima nelle figure del re Luigi XII e di Charles d'Amboise, signore di Chaumont, maresciallo di Francia e governatore di Milano, per poi passare al nuovo delfino di Francia Francesco I. Lo sviluppo della tecnologia vinciana sembra aver ricevuto una nuova linfa vitale in funzione dei rapporti intessuti da Leonardo con la Francia. I patroni francesi furono abili a richiamare al loro servizio Leonardo e a coinvolgerlo in progetti straordinari quanto a spettacolarità e magnificenza. Proprio il contatto con la nuova e stimolante cultura francese portò influssi che solleticarono la sua fantasia a progettare macchine di stupore e meraviglia, giustamente definite con il termine di "macchine francesi" da Carlo Pedretti[1] nel 2005. Rientrano in questa definizione tutti quegli straordinari meccanismi automatici e quelle opere di ingegneria idraulica che fanno capo a progetti francesi e da Leonardo definiti al foglio 317 r-b [872 r] del Codice Atlantico (*c.* 1508) "Strumenti e cose che saran di gran piacere al nostro cristianissimo re"[2].

I primi contatti tra Leonardo e la Francia risalgono al primo soggiorno milanese (1482-1499) e quindi a una data *ante quem* 1506, quando Leonardo, nonostante fosse impegnato a Firenze nella commissione della *Battaglia di Anghiari*[3] affidatagli dal gonfaloniere Pier Soderini e *in fieri* dal 24 ottobre 1503, riceve la chiamata che da lì a poco avrebbe inaugurato il suo secondo soggiorno milanese.

Rivendicato il suo diritto al trono di Napoli come erede degli Angioini e contando sull'appoggio di molti principi italiani che ne avevano assecondato la venuta, nel settembre 1494 il re di Francia Carlo VIII discese in Italia a capo di un imponente esercito forte di circa trentamila uomini. Accolto festosamente dalle varie corti, il re di Francia entrava nelle città sfilando con un esercito composto da cavalieri rivestiti da eleganti armature, da fanti che trasportavano un'artiglieria all'avanguardia, e da musici che preannunciavano il corteo regale scandendone il ritmo. Queste innovazioni dovettero suscitare molta impressione al tempo, tanto da essere descritte da Melchiorre Ferraiolo nella *Cronaca della Napoli aragonese* (New York, Pierpont Morgan Library, Ms. 801, ca. 1494-1498). Il manoscritto reca delle miniature che raffigurano lo sfarzoso corteo durante la sua entrata nella città partenopea, il 22 settembre 1495. Una cura minuziosa è riservata ai dettagli con cui sono rappresentati lo sfarzo dei costumi da parata, i piumaggi dei fantasiosi copricapi e le artiglierie leggere che sfilavano nel fastoso corteo.

Anche a Milano, Carlo VIII e le sue truppe entrarono indisturbati con il favore di Ludovico il Moro che, con l'appoggio del re francese, voleva sbarazzarsi del nipote Gian Galeazzo, erede legittimo del Ducato. L'entrata a Milano è documentata da Leonardo con schizzi a matita rossa eseguiti su alcuni fogli del Manoscritto H, che registrano puntualmente le innovazioni tecnologiche delle truppe francesi. Tali schizzi, con tutta probabilità realizzati dal vero, documentano le splendide bardature e i finimenti dei cavalli, i carri da traino utilizzati per trasportare facilmente le munizioni e, in particolare, le cosiddette *colubrine*. Queste erano artiglierie di un genere particolare: più piccole, più maneggevoli ma più lunghe dei cannoni, erano caratterizzate da una canna sottile, perciò di minor calibro per una carica più veloce, e, fuse in un solo pezzo in bronzo, erano in grado di esplodere colpi in rapida successione e di lunga portata.

Proprio nel 1494 dalla Francia giungono cronache di parate e cerimonie trionfali che testimoniano l'esistenza a Lione di fontane da vino realizzate per la popolazione come segno di prosperità e ricchezza. Si spiegano così i calcoli di acqua e vino appuntati da Leonardo al foglio 218 r-b [585 r] del Codice Atlantico (fig. 1). Il foglio, in origine unito al foglio 247 r-a [669 r] dove si legge il cosiddetto promemoria di Ligny: "Truova ingli [= *Ligni*] e dilli che tu l'aspetti a morrà [= *a Roma*] e che tu andrai con seco a ilopanna [= *a Napoli*]", è databile attorno al 1499-1500. Questo *memorandum* criptato si riferisce alla missione segreta di accompagnare il francese Luigi di Lussemburgo, conte di Ligny, a Roma e a Napoli.

Durante questo periodo, Leonardo riprende lo studio delle automazioni e della robotica[4] – tema a cui si era già dedicato durante gli anni giovanili – schizzando il complesso sistema di meccanismi per animare un automa umanoide al foglio 216v-b [579r] del Codice Atlantico, databile tra il 1494 e il 1497. L'automa di Leonardo era il frutto delle ricerche compiute dall'artista in campo anatomico e cinetico, studi in parte perduti e in parte registrati nel Codice Huygens, ora alla Pierpont Morgan Library di New York. Leonardo traccia l'idea di una sorta di *anathomia artificialis*: dopo aver studiato il corpo umano arriva quindi alla creazione di una meravigliosa macchina umanizzata. Le conoscenze delle automazioni imparate nella bottega del Verrocchio e poi perfezionate in seguito, trovavano a Milano un ambiente ricettivo. La corte sforzesca era sicuramente un ambiente ricco di stimoli nel quale circolavano manoscritti, in particolar modo quelli arabi che, tradotti, divulgavano l'eccellenza tecnologica raggiunta nell'antichità. Vi erano artisti specializzati come Giovanni Fontana, figura poliedrica di umanista e inventore di congegni automatizzati come il *Diavolo Meccanico* e la *Strega infuocata*[5] oppure l'anonimo costruttore del *Diavolo meccanico* appartenente alla collezione Settala e adesso esposto al Castello Sforzesco[6]. Tratto in comune di questi automi era l'utilizzo di un congegno proprio dell'orologeria. Tale meccanismo a scappamento era comunque già conosciuto da Leonardo durante il primo periodo fiorentino grazie all'amicizia che lo legò a Lorenzo della Volpaia architetto, orafo, matematico e, soprattutto, orologiaio e costruttore di strumenti scientifici[7].

Da parte loro anche i francesi si mostravano sempre più interessati alle opere arti-

stiche che il Vinci aveva realizzato per Ludovico il Moro a Milano. Il ricordo del colossale cavallo sforzesco – distrutto durante i primi mesi dell'invasione francese a Milano così com'è ricordato da Sabba Castiglione e in seguito anche da Vasari – è ancora vivo quando, in data 19 settembre 1501, Ercole d'Este scrive una lettera a Giovanni Valla, suo agente a Milano, perché si facesse cedere la forma della fusione rimasta nella Corte Vecchia del Castello Sforzesco. Un rinnovato interesse per il cavallo sforzesco è sancito anche dalla nota di preventivo che Leonardo appunta da Firenze al foglio 179 v-a [492 r] del Codice Atlantico. La spesa era calcolata per la richiesta fatta dal maresciallo Gian Giacomo Trivulzio di coronare con un cavallo rampante la sua sepoltura nella basilica di San Nazaro, come si legge nel suo testamento datato 2 agosto 1504. Un primo interesse diretto dei committenti francesi si concentrò sulle opere pittoriche. È ricordata la commissione della *Vergine dei fusi,* dipinta a Firenze nel 1501 per Florimond Robertet, segretario del re Luigi XII. Intanto a Milano, la bottega dell'allievo Marco d'Oggiono stava raggiungendo un grande successo perpetuando lo stile del maestro anche in sua assenza. È documentato il tentativo – poi fallito – di staccare l'affresco del *Cenacolo* su ordine di Luigi XII, forse su consiglio del consulente artistico Jean Perréal. Il 24 maggio 1503 furono richieste le prime copie su tavola del grande dipinto murario: quella ad opera di Bramantino, commissionata dal tesoriere Antonio Turbino, e quella di Marco d'Oggiono per il protonotario Gabriel Goffer. Si aggiungano le numerose versioni dei vari *Salvator Mundi* che, più tardi, popoleranno l'ambiente milanese e francese. Inoltre a Milano, era sempre in corso l'annosa vicenda giudiziaria relativa alla *Vergine delle Rocce*, seguita direttamente dal socio Ambrogio De Predis. Un punto fermo fu l'atto conclusivo, datato 27 aprile 1506, che stabiliva che Leonardo avrebbe dovuto fornire alla Confraternita di San Francesco Grande un'altra versione del dipinto, più conforme ai loro voleri, da terminare entro due anni[8].

Assecondando i voleri del re Luigi XII, interessato a servirsi di Leonardo e sfruttando gli obblighi derivati dalla vicenda giudiziaria della seconda versione *Vergine delle Rocce*, Charles d'Amboise con un'abile mossa politica giocata attraverso un delicato scambio di lettere diplomatiche con il gonfaloniere Pier Soderini, riuscì ad assicurarsi la presenza di Leonardo a Milano e ad assoggettare Firenze al volere dei francesi sotto cui cercava riparo e alleanza[9]. Nato inizialmente come soggiorno momentaneo, il cosiddetto secondo periodo milanese di Leonardo si risolverà di fatto in una lunga sosta – dal maggio del 1506 al settembre del 1513 – eccezione fatta per alcuni brevi spostamenti a Firenze. A coronamento di questo fecondo periodo arriverà nel 1515 l'invito da parte di Francesco I di recarsi in Francia, dove Leonardo trascorrerà gli ultimi anni tra il 1517 e il 1519. Impossibile non menzionare anche altre due macchine costruite in diretto contatto con la Francia: il contatore d'acqua e il leone meccanico. In alcuni fogli del Codice Atlantico e del Manoscritto G databili attorno al 1510-1511, Leonardo progettò un contattore d'acqua per Bernardo Rucellai. La macchina idraulica risulta, al momento, l'unica macchina effettivamente realizzata da Leonardo di cui si ha notizia poiché è menzionata e illustrata da Benvenuto della Volpaia nel suo taccuino

conservato presso la Biblioteca Marciana a Venezia, dove al foglio 7 v si legge: "Copia d'uno strumento che mandò Lionardo da Vinci a Bernardo Rucellai di Francia, fatto là da un suo villano da Do (m) dassoli [Domodossola] il quale qui disegnato si vede". Non sfugge neppure la connessione con la Francia: Domodossola si trovava al tempo sotto il dominio francese e per di più Rucellai era stato ambasciatore fiorentino presso la corte milanese[10]. Alcune fonti attestano che per Francesco I, incontrato per la prima volta a Bologna nel 1515, Leonardo realizzò un leone meccanico, allegoria politica fatta sfilare in occasione della sua entrata ufficiale a Lione il 12 luglio 1515 con il titolo di nuovo re di Francia. Di questo automa non sembra esserci traccia nei fogli di Leonardo: l'unica testimonianza diretta è fornita dalla *Descrizione delle felicissime nozze della Christianissima Maestà di Madama Maria Medici Regina di Francia e di Navarra* di Michelangelo Buonarroti il Giovane, manoscritto conservato alla Biblioteca Riccardiana di Firenze. Il testo contiene la descrizione dei festeggiamenti organizzati il 5 ottobre 1600 per celebrare le nozze di Maria de' Medici e Enrico IV. Il Buonarroti testimonia che, durante il sontuoso banchetto nuziale, un automa simile camminò "nella testa della tavola di mezzo di quelle gentil donne, per colmare la meraviglia, in aspetto fiero un Leone ebbe, che posando su quattro piedi, allora che a tavola elle si misero, prendendo moto, e sollevandoci in due, aprirsi il seno si vide, e pieno di gigli mostrarlo: concetto simile a quello, il quale Lionardo da Vinci nella città di Lione nella venuta del Re Francesco I, mise in opera per la nazion' fiorentina". Il leone, che rimandava all'alleanza tra la Firenze medicea e Francesco I di Francia, era un automa programmabile che rappresentava un prodigio della tecnica. Da un punto di vista meccanico, il dispositivo semovente costituiva un *unicum* poiché, dal racconto che si ricava del testo seicentesco, doveva essere munito di un particolare meccanismo programmabile a tempo per compiere un movimento articolato in fasi distinte: camminare verso il re, arrestarsi al suo cospetto, sollevarsi sulle zampe posteriori e mostrare il petto da cui ricadevano fiori di giglio[11]. Ne segue che l'asserzione appuntata da Leonardo al foglio 317 r-b [872 r] del Codice Atlantico datato attorno al 1508 – "Strumenti e cose che saran di gran piacere al nostro cristianissimo re" – presuppone che egli volesse realizzare per il re, oltre ad alcune opere artistiche e ingegneristiche, dei congegni che non sarebbe fuori luogo identificare con virtuosismi tecnologici capaci di destare meraviglia e stupore. Rientrano in questa categoria, pertanto, i giochi d'acqua, i meccanismi a sorpresa, gli strumenti musicali, i congegni pneumatici e idraulici, gli automi e gli orologi. In più se ne deduce che il re avesse avuto già modo di ammirare qualche congegno semiautomatico.

L'acqua ha un ruolo fondamentale all'interno del pensiero di Leonardo, che intendeva raccogliere le sue osservazioni nel *Libro delle acque*. Gran parte dei suoi disegni, infatti, sono il risultato di un interesse costante per l'acqua: il progetto di deviazione del corso dell'Arno per Pisa, la bonifica delle paludi Pontine nel Lazio, la canalizzazione della regione francese della Sologne. Egli studia i movimenti dell'acqua e la loro azione erosiva. Anche da un punto di vista strettamente artistico, l'acqua gioca un ruolo essenzia-

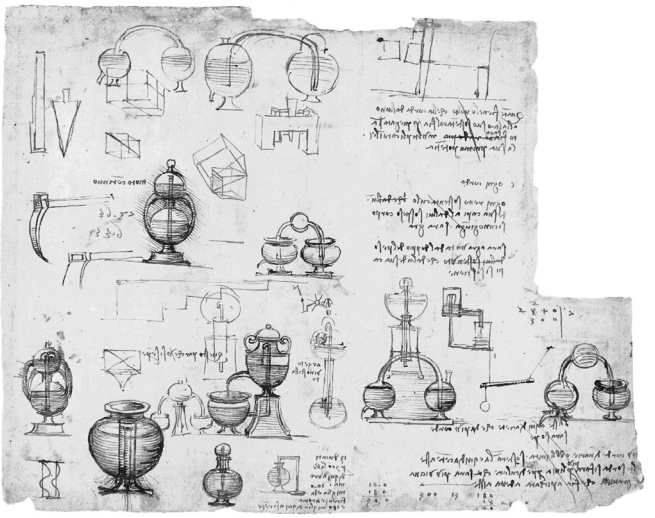


Fig. 2. *Studi di dispositivi idraulici*, c. 1513, in *Codice Atlantico*, f. 400r-b [1113r], Milano, Biblioteca Ambrosiana.

le: nella *Vergine delle Rocce* o nella *Sant'Anna*, il paesaggio ha un forte impatto emotivo non soltanto come scenario della prodigiosa epifania divina. Proprio i congegni idraulici, nei quali Leonardo applica le sue conoscenze più all'avanguardia in materia di robotica, pneumatica, orologeria e ingegneria, rappresentano il punto più alto della specializzazione tecnologica raggiunta. I sistemi idraulici e le fontane sono "progetti francesi" poiché la fase più sviluppata della tecnologia vinciana nasce a stretto contatto con i progetti architettonici elaborati a Milano per Charles d'Amboise e in Francia per Francesco I. I punti di riferimento che avrebbero ispirato Leonardo nella creazione di ingegnosi sistemi idraulici sono, senza dubbio, i testi antichi. Oltre a Vitruvio e Filone di Bisanzio, che facevano parte della sua biblioteca, Erone di Alessandria ebbe un ruolo molto importante. Egli ideò sistemi meccanici ingegnosi come l'organo ad acqua, automi, statue in grado di servire il vino e i primi orologi ad acqua. I meccanismi di Erone sono descritti da Leon Battista Alberti nei suoi *Ludi Matematici* ma anche nell'enciclopedia di Giorgio Valla del 1501, che Leonardo possedeva. Ad interessarlo furono inizialmente le cosiddette "fontane da tavola" o "fontane di Erone", oggetti straordinari, caratterizzati dalle forme e dagli stili più vari, destinati a decorare le tavole imbandite. Il funzionamento di questi dispositivi consisteva nella pressione dell'aria sull'acqua, che poteva così zampillare. Queste, utilizzate per dispensare vino o altre bevande colorate ai commensali, potevano essere realizzate in argento o in altro materiale, spesso prezioso, e difficilmente avrebbero superato i 25 cm in altezza. I congegni di Erone affascinarono Leonardo per un ampio lasso di tempo, come dimostrano i numerosi riferimenti che troviamo nei suoi fogli. Egli realizza congegni idraulici basati sul principio eroniano di sifone ai fogli 400 r-b [1113 r] (fig. 2) e 400 v-b [1113 v] del Codice Atlantico, databili al 1513 per la nota del preventivo del viaggio da Milano a Roma passando per Firenze, e anche in due fogli del Manoscritto G, più tardi perché databili attorno al 1515. Una prima menzione, "Erone de acque", si trova nel foglio 96 v-a [264 v] del Codice Atlantico, datato al 1516 sulla base delle planimetrie realizzate per Giuliano de' Medici. Una seconda menzione, "Erone de acque. De liquidi di varie gravità che si mistano e di quelli che non si mistano", ritorna in rapporto alla teorizzazione dell'*impetus* e della formazione delle onde al foglio 219 v-a [589 v], datato da Pedretti al 1516, e forse già francese.

A ispirarlo nella creazione di mirabolanti effetti furono anche alcuni *objects d'art*. Tra questi è da citare la spettacolare Torre dei Venti, un orologio idraulico monumentale, posto sulla piazza dell'Agorà romana di Atene, dotato di un complesso meccanismo e decorato da figure in alto rilievo che rappresentano le divinità dei venti su ogni facciata della costruzione. Resa nota da Vitruvio nel *De architectura*, la Torre dei Venti ebbe una straordinaria fortuna durante il Quattrocento: è stato ipotizzato che il progettista della Torre del Marzocco nel porto di Livorno, realizzata all'inizio del XV secolo da un architetto da individuare in figure del calibro di Lorenzo Ghiberti, Filippo Brunelleschi o Leon Battista Alberti, si fosse ispirato alla costruzione greca per la sua realizzazione. Anche nel Cinquecento, la fama della Torre dei Venti non venne meno: oltre a essere citata da Daniele Barbaro nel suo commentario vitruviano, la sua forma ispirò Bernardo Buontalenti per la realizzazione della celebre tribuna nel braccio lungo degli Uffizi a Firenze.

Durante le sue peregrinazioni al seguito di Cesare Borgia, Leonardo restò affascinato dalla fontana della Pigna a Rimini per l'armonia prodotta dai suoi getti d'acqua. La fontana, di età romana, era caratterizzata da una struttura architettonica a due vasche poligonali che ricevevano l'acqua erogata da quindici cannelle poste al centro di specchiature marmoree disposte sul perimetro del tamburo centrale con base a pianta poligonale. Al foglio 78 v del Manoscritto L egli appuntava: "fassi un'armonia con le diverse cadute d'acqua, come vedesti alla fonte di Rimini, come vedesti addì 8 agosto 1502"[12]. Il significato della frase non è del tutto chiaro perché egli scrive la parola "vedesti" e non "udisti" riferendosi forse più che all'armonia sonora, ai getti d'acqua. A questo proposito non è fuori luogo collegare la nota sulla fontana al foglio 55 r del Codice Madrid II, dove si legge la nota intitolata "D'armonia": "D'una caduta d'un'acqua se ne facci un'armonia, che componga una piva co' molte consonanze e boci. Fermeremo i nostri vasi di terra, di poi il corso dell'acqua ch'essce de' vasi mova una rota dentata nell'albero suo. Li quali denti apra[n] le canne dell'acqua che cade ne' vasi, di mano in mano, secondo il lor bisogno, come fa la mano sopra li tassti dell'organo. E ancora sia adatta che ssi possa sonar con mano". La nota si conclude con il *memorandum* annotato frettolosamente "Domanda messer Marcello, del sono fatto con acqua da Vetruvio". Messer Marcello, al quale Leonardo vuole chiedere delucidazioni riguardo al passo di Vitruvio, è stato identificato con Marcello Virgili di Adriano Berti, professore dell'Università di Firenze. Sotto il disegno, Leonardo appunta velocemente di "tastarne d'organo". Nel 1977, Pedretti sottolinea che tale descrizione poteva essere connessa al foglio 136 r [P 77] del Codice Arundel dove, intervallato da note riguardanti strumenti musicali, Leonardo studia un complesso organo a canne disposte su quattro file a spirale. La fonte più prossima per la costruzione di un organo idraulico si ritrovava in un complesso testo di Vitruvio (Libro X, capitolo VIII). Anche l'organo idraulico, pertanto, rientrava nella tipologia dei congegni automatici. Di fondamentale importanza furono anche le opere realizzate dai suoi contemporanei, come il Sangallo e Fra Giocondo, quest'ultimo attivo proprio in Francia come si legge al foglio 20 r del Manoscritto K, datato al 1507, "condotto di Bles [*Blois*]

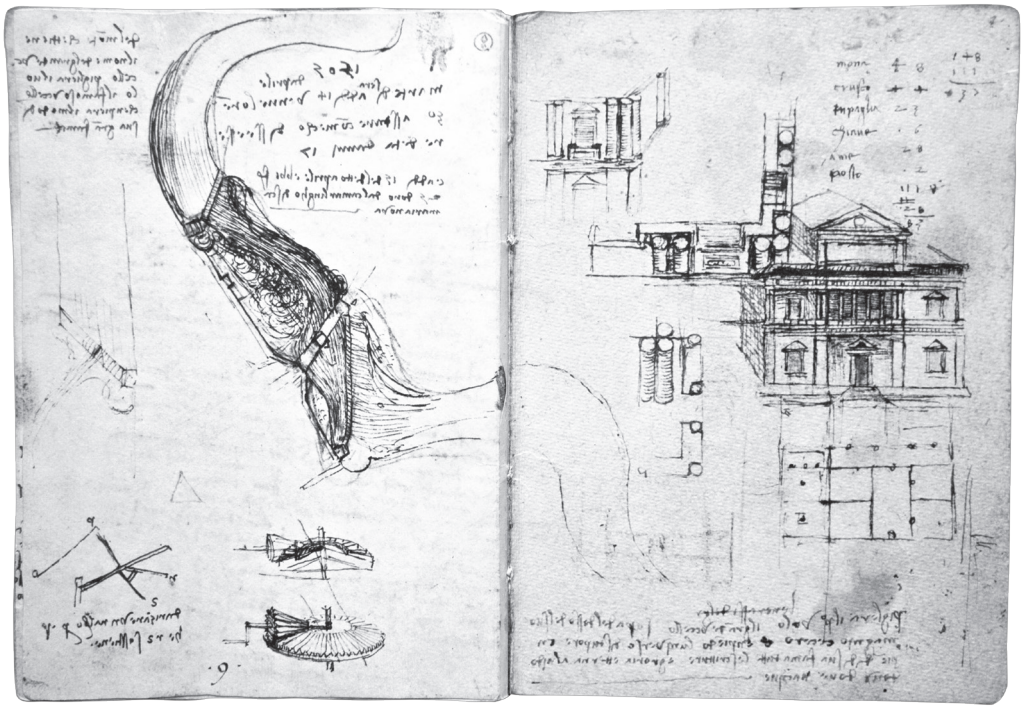


Fig. 3. *Studio per una villa*, c. 1505, in *Codice del volo degli uccelli*, verso del retro di copertina, Torino, Biblioteca Reale.

fatto in Francia da Fra Giocondo"[13] e di cui avrebbe potuto aver notizia da Francesco Pandolfini, ambasciatore fiorentino alla corte di Francia presso Blois.

Charles d'Amboise fu, senza dubbio, la figura chiave che riuscì ad assicurare la presenza di Leonardo a Milano sotto il dominio francese. Appena entrato al suo servizio, Leonardo ricevette l'incarico di progettare una nuova residenza extra-urbana[14]. Il progetto (fig. 3) prevedeva la realizzazione di una loggia aperta, scandita da lesene e colonne di ordine classicheggiante, simile alla Farnesina realizzata da Baldassarre Peruzzi per il ricco banchiere Agostino Chigi soltanto tra il 1508 e il 1511. L'architettura si affacciava direttamente sul giardino, per il quale erano previsti spettacolari giochi d'acqua, fontane, voliere e strumenti musicali realizzati con ingegnosi congegni idraulici. Nell'*Annunciazione* degli Uffizi è già presente un'idea iniziale per un giardino ordinato e disciplinato dall'architettura. L'esempio più prossimo, a cui Leonardo poteva aver accesso, era la Villa Medici a Fiesole, riprodotta come è noto nell'affresco con la *Morte e Assunzione della Vergine* dipinto da Domenico Ghirlandaio nella cappella Tornabuoni tra il 1485 e il 1490 nel coro di Santa Maria Novella.

Il *jardin de rêve* progettato per Charles d'Amboise doveva rappresentare un *locus amoenus* nel quale si voleva ricostruire un microcosmo politico, civilizzato e dedicato

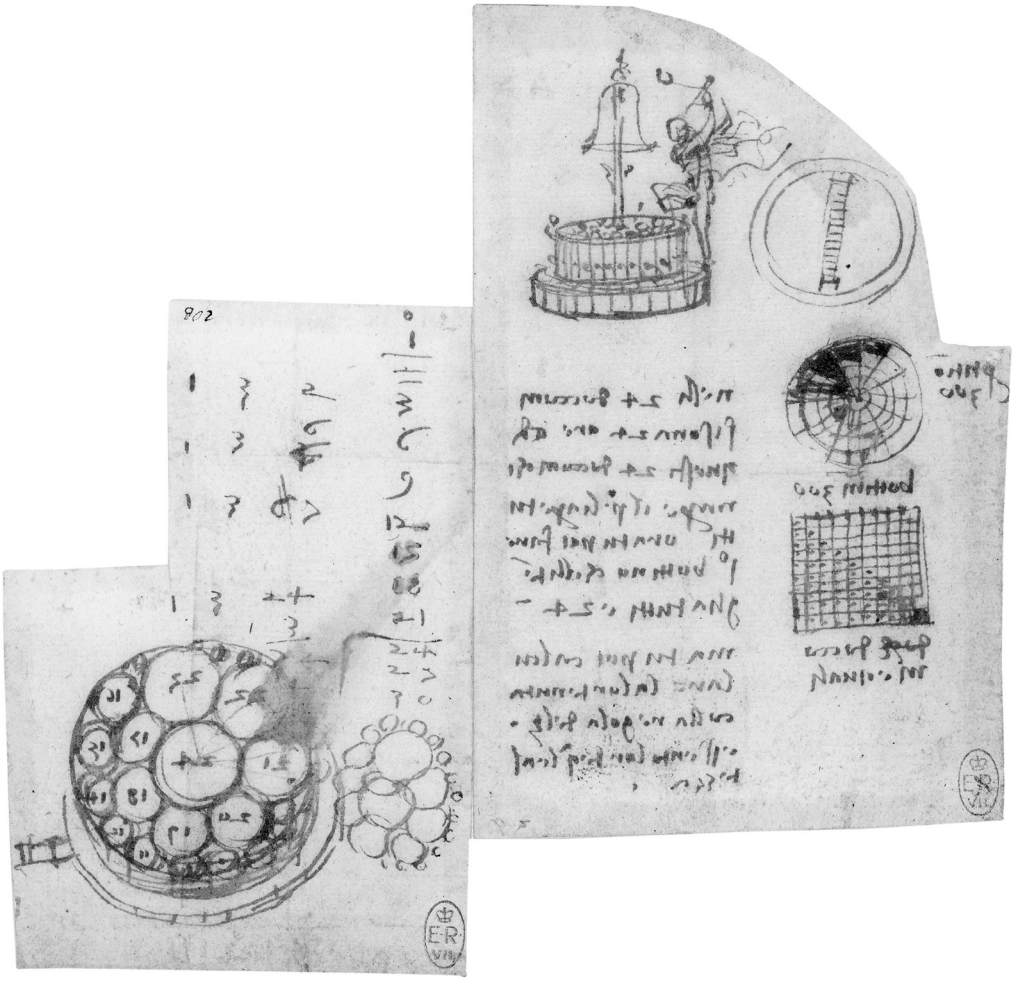


Fig.4. *Studio per un orologio idraulico con automa che batte le ore*, c. 1508-1510, Windsor, Royal Library, RL 12688 and 12716.

interamente all'*otium*. La villa di delizie era dotata di congegni idraulici molto particolari alimentati dai corsi Nirone e Fontelunga. Al foglio 271 v-a [732 v] del Codice Atlantico, Leonardo descrive in modo dettagliato le fantasiose invenzioni idrauliche ideate per il giardino: "col molino farò generare vento d'ogni tempo della state; farò elevare l'acqua surgitiva e fresca […] e altra acqua correrà pel giardino, adacquando li pomeranci e cedri ai lor bisogni […] Li pesci debbano essere di quelli che non intorbidino le acque, cioè non vi si metta anguille, né tinche, né ancora lucci, perché distruggan li altri pesci. Farassi, mediante il mulino, molti condotti d'acqua per casa e fonti in diversi lochi, e alcuno transito dove, chi vi passerà, per tutte le parti di sotto salterà l'acque allo insù; e così farà a posta di chi vorrà bagnare sotto alle femine o altri, che di lì passerà. Disopra

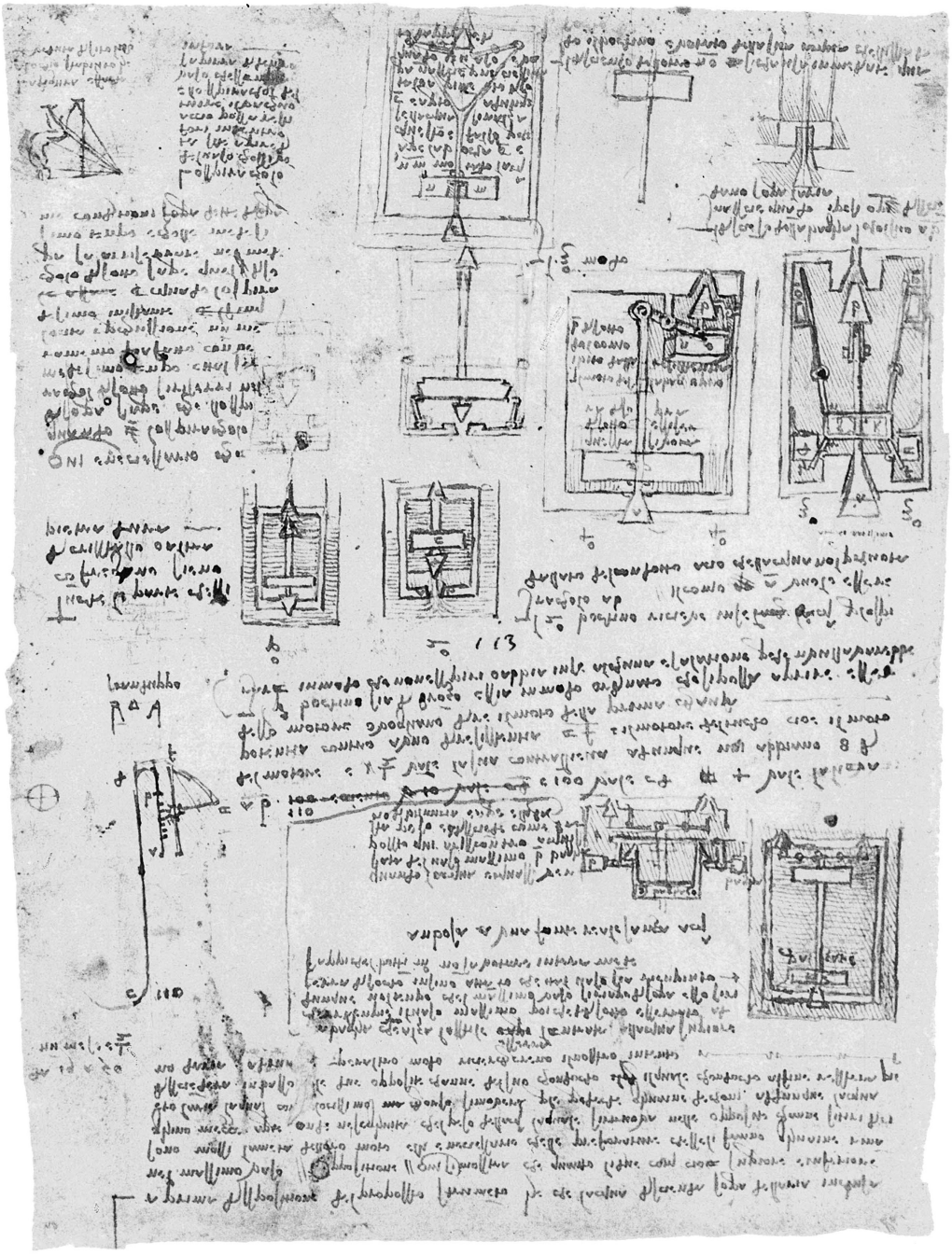


Fig. 5. *Studio di meccanismi per una fontana*, c. 1517-1518, in *Codice Atlantico*, f. 296r-a [810r], Milano, Biblioteca Ambrosiana.

farèno una sottilissima rete di rame, la qual coprirà il giardino, e rinchiuderà sotto a sé molte varie sorte di uccelli; e così arète musiche continue, insieme con li odori de' fiori di cedri e limoni. Col mulino far. continui soni di vari strumenti, li quali tanto soneran, quanto durerà il moto di tal molino".

Nei progetti per Charles d'Amboise, si accenna poi a un uccello meccanico, da porre in relazione all'automa che Leonardo aveva realizzato per la *pièce* dell'*Orfeo* del Poliziano all'interno della complessa macchina teatrale studiata nei fogli 231 v e 224 r [P 137] del Codice Arundel[15], e, soprattutto, a un grandioso orologio[16] azionato ad acqua e posto al centro del giardino (fig. 4). L'elaborato dispositivo idraulico, studiato nei fogli RL 12688 e 12716 di Windsor, consisteva in un orologio a meccanismo idraulico di grandi dimensioni, composto da due congegni separati: un orologio ad acqua e un segna tempo che scandiva il passaggio delle ore. L'orologio ad acqua era munito di vasche o meglio bottini – chiamati *baga* da Leonardo – per il trasferimento dell'acqua da un livello all'altro e galleggianti circolari che salgono lungo assi elicoidali. È possibile rintracciare l'elaborazione del congegno dei bottini in vari schizzi, evidenziando i miglioramenti apportati (fig. 5). È significativo sottolineare che le sezioni dei ventiquattro bottini, corrispondenti alle ventiquattro ore, hanno diverso diametro. L'accorgimento deriva dall'intuizione della "legge di portata" formulata soltanto in seguito, detta anche, non a caso, "legge di Leonardo". Secondo questo principio della dinamica dei fluidi, un liquido ideale che scorre in un condotto ha una velocità inversamente proporzionale rispetto alla sezione del condotto stesso. A coronamento dell'orologio si trova una statua virile che, munita di un bastone, batte e scandisce le ore. Due potrebbero essere gli orologi che ispirarono Leonardo. L'orologio della cattedrale di Strasburgo dotato di automi, la cui conoscenza poteva essere stata trasmessa dai lapicini d'oltralpe che lavoravano al cantiere della cupola del Duomo di Milano, e il grandioso orologio sul campanile di Venezia dove la presenza di Leonardo fu registrata nel 1500. Anche la Francia e il Belgio potevano contare su un'antica tradizione nella fabbricazione di orologi muniti di un *jacquemart*, termine che indica l'automa di solito rappresentato come un personaggio scolpito nel legno o in bronzo che indica le ore percuotendo una campana con un martelletto. Un esempio molto rappresentativo è costituito dal *jacquemart* della collegiata di Saint Pierre a Lovanio in Belgio.

Nel 1517 Leonardo si trasferisce in Francia su invito di Francesco I e si stabilisce nel castello del Clos Lucé, presso Amboise. In Francia si occupa di progettare la residenza reale di Romorantin, per la quale, oltre a riprendere e sviluppare alcune delle più belle e innovative idee già affrontate per Ludovico il Moro e per Charles d'Amboise, propone numerosi lavori di ingegneria idraulica. I progetti di questo periodo sono caratterizzati da numerose e dettagliate planimetrie del grande complesso urbano, accompagnate da brevi testi correlati. L'intento programmatico è comunque scandito al foglio 270 v [P 153] del Codice Arundel nel quale, accanto agli studi per la nuova residenza reale di Romorantin si legge: "Facciasi fonti in ciascuna piazza". Molte le note in cui ricorre la parola fonte o fontana. Tra queste al foglio 296r-a [810r] del Codice Atlantico si legge

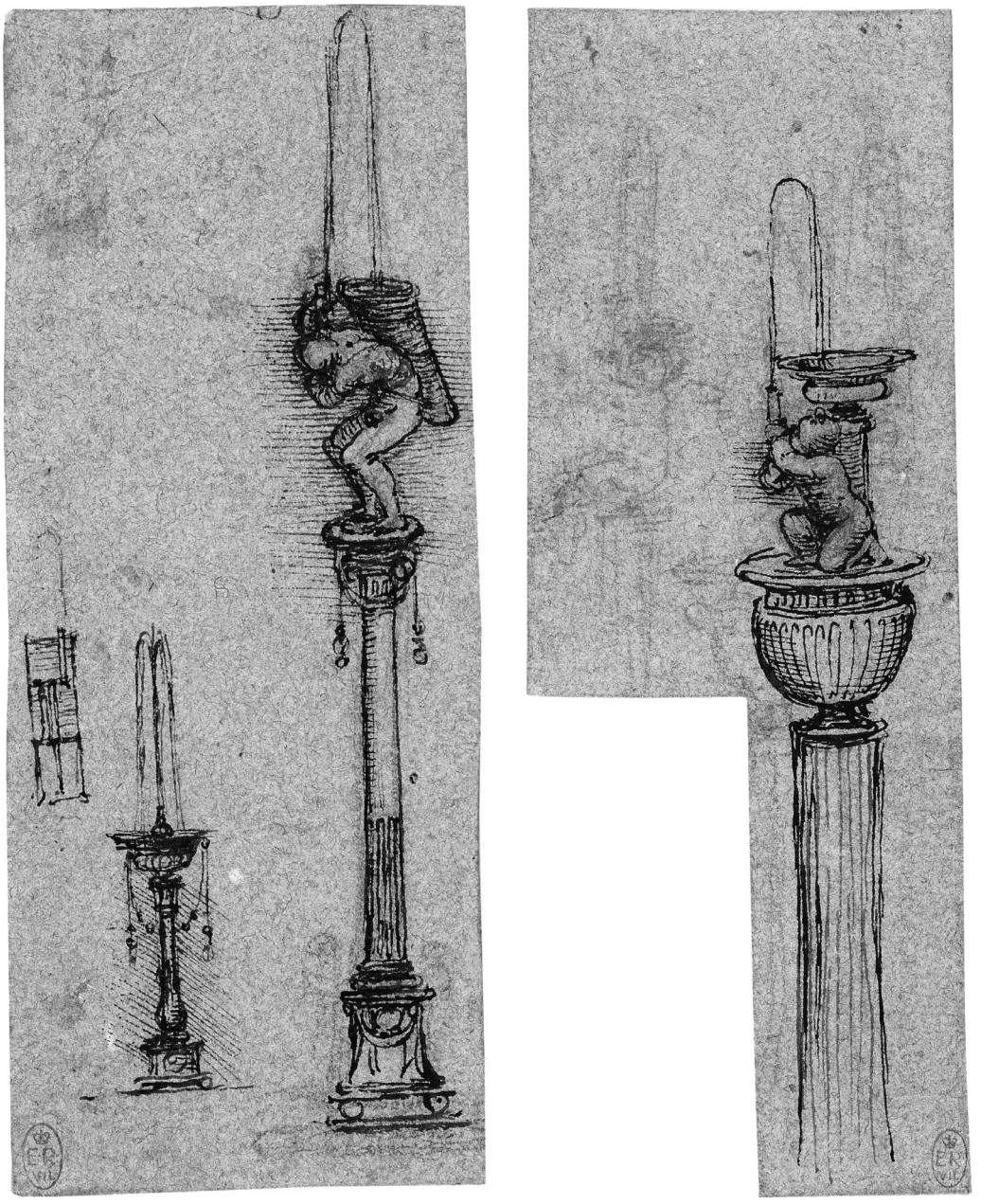


Fig. 6. *Studi per una fontana*, c. 1511-1513, Windsor, Royal Library, RL 12691 e RL 12690.

"Ambosa (Amboise) ha una fonte reale sanza acqua". In un libro a stampa[17] di Gilles Corrozet, pubblicato per la prima volta a Lione nel 1535 e riproposto in seguito nel 1558 a Venezia, con il titolo di *Historia di tutte le città, ville, fiumi, fonti, et altre cose notabili della Franza*, si legge che nella zona delle Gallie esistevano effettivamente anche fontane senz'acqua. Corrozet menziona una *fontana ardente* presso Grenoble, che produceva fuoco grazie a un meccanismo noto anche a Erone d'Alessandria, una *fontana che produceva pietre preziose* nel Delfinato, che aveva la capacità di guarire gli occhi dalle impurità e produrre pietre levigate. L'elenco comprende anche una *fontana che significa fertilità dei beni* presso Levandore (attuale Le Lavandou) una sorgente temporanea che dona acqua e pesce durante in periodi di carestia, una *fontana detta Fonfort* presso Calmiere, fonte termale e di acqua gasata, una *fontana vinosa* presso Lalois (a Saint Louis nell'Alto Reno) sulle montagne di Auvergne il cui sapore è proprio delle fonti ferruginose-acidule, una *fontana che ingenera pietre* presso Rosfillion (attuale Roussillon), che doveva essere una macina. Infine, due fontane a Clermont: una *fontana oliosa*, che produce una sostanza resinosa per curare le articolazioni, e una *fontana fangosa* che la vigilia del giorno di San Pietro era capace di mutare il fango in acqua cristallina. Non è possibile sapere se anche a Amboise esistesse una di queste fonti poiché la città non rientra tra quelle menzionate ma due potrebbero essere le soluzioni, entrambe da verificare. La prima ipotesi porterebbe a pensare che anche nella città di Amboise esistesse una fontana senza acqua appartenente a una delle tipologie descritte. La seconda ipotesi vorrebbe che la nota fosse riferita alla città di Clermont, dove nel 1511 il vescovo della città, Jacques d'Amboise, fece costruire allo scultore Chapard una fontana marmorea ancora esistente. Se la parola "Ambosa" fosse da riferirsi al vescovo e, per esteso, alla sua diocesi, la fonte senza acqua potrebbe essere identificabile in una delle tipologie associate alla città da Corrozet: quella oliosa, quella che ingenera pietra oppure quella fangosa.

Leonardo si dedicò allo studio di congegni idraulici e fontane per un lungo periodo di tempo, circa venti anni. Eccetto lo studio per le macchine del volo, nessun altro campo di ricerca sembra interessarlo così a lungo. Durante questo periodo, è possibile registrare una sorta di sviluppo che risponde a regole di gusto e motivi tecnici. I disegni di fontane ben mostrano un'elaborazione architettonica che si rintraccia nei vari modelli proposti da Leonardo. Inizialmente, alcuni disegni mostrano forme caratterizzate da una più antica struttura a candelabra, diffusa a Firenze attorno al XV secolo come attestano le creazioni di Donatello e del maestro Verrocchio. Più tardi, invece, attorno al 1513, si assiste a un rinnovamento per il quale le fontane proposte da Leonardo, pur se basate sempre sui meccanismi eroniani, sono caratterizzate da forme più complesse nelle quali colpisce l'elemento centrale composto da una colonna sormontata da una figura, come si apprezza nei disegni RL 12690 e 12691 conservati a Windsor (fig. 6).

La lezione di Leonardo sarà elaborata e recepita grazie agli effetti spettacolari dei dispositivi idraulici che divennero ben presto un *topos* nell'architettura dei giardini cinquecenteschi: a Firenze, grazie alle magnifiche creazioni di Niccolò Tribolo eseguite per Cosimo I a Villa di Castello e in seguito al Giardino di Boboli, a Tivoli, in particolare,

con l'organo idraulico co realizzato da Pirro Ligorio. La lezione di Leonardo è destinata ad attraversare le Alpi per raggiungere non soltanto la Francia, dove la summa delle sue conoscenze idrauliche sarà raccolta da Bernard Forest De Belidor nei quattro libri che compongono la sua opera monumentale *Architecture hydraulique, ou L'art de conduire, d'*élever *et de ménager les eaux pour les différens besoins de la vie* edita a Parigi tra il 1782 e il 1790, ma anche la Germania, con Heinrich Schickhardt che durante il suo soggiorno in Italia non solo disegnò alcune invenzioni tratte direttamente da Leonardo ma anche alcuni giochi d'acqua visti alla Villa di Pratolino a Firenze, e infine la Spagna, con Juanelo Turriano orologiaio e ingegnere idraulico cremonese che entrò al servizio dell'imperatore Carlo V nel 1529.

È dunque evidente come il contatto con la cultura francese riesca a stimolare la fantasia di Leonardo mettendolo nelle condizioni di produrre macchine di stupore e meraviglia che proprio in Francia troveranno grande apprezzamento a corte. L'eccellenza della tecnologia vinciana si sviluppa a contatto con i francesi, le cui truppe, entrate a Milano nel 1499 al comando di Gian Giacomo Trivulzio, Maresciallo di Francia e capitano delle truppe francesi in Italia, avrebbero paradossalmente assistito alla definitiva distruzione del modello per la fusione del monumento equestre progettato dall'artista tra il 1482 e il 1493 e lasciato nel cortile del Castello Sforzesco, sia costretto Leonardo a riparare prima a Mantova, poi a Venezia e infine a Firenze. Sarà in seguito la sottile rete dei delicati rapporti diplomatici tra la Francia e Firenze che permetterà a Leonardo di legarsi al re Luigi XII, a Charles d'Amboise e al nuovo delfino di Francia Francesco I che lo porterà ad Amboise, dove Leonardo si dirige nel 1517 – come sottolinea Carlo Pedretti – "Non per trovare rifugio nell'accogliente protezione di un re di Francia, ma per contribuire a realizzare un futuro che per lui è già cominciato"[18].

Note

* Leonardo da Vinci, Codice Arundel, f. 270 v. Questo saggio nasce come una prima riflessione sui risultati a cui sono pervenuta durante le mie ricerche sul tema dei congegni idraulici e delle fontane di Leonardo che sono in corso di svolgimento per il mio post-dottorato presso l'Ecole Pratique des Hautes Etudes alla Sorbonne a Parigi sotto la direzione della professoressa Sabine Frommel.

1 Carlo Pedretti ha usato per la prima volta la definizione di "macchine francesi" nel suo intervento dal titolo *Les machines françaises de Léonard de Vinci*, in occasione del XLVIII° Colloque International d'Études Humanistes *Les machines à la Renaissance*, organizzato dal 27 Luglio al 1 luglio 2005 nella città di Tour da Pascal Brioist, Hélène Vérin e Luisa Dolza con la partecipazione dell'Università François-Rabelais di Tours, del Centre National de la Recherche Scientifique du Conseil Général d'Indre-et-Loire e del Conseil Régional de la Région Centre, ma del quale non sono stati pubblicati gli atti. Ringrazio il professor Carlo Pedretti per aver messo a mia disposizione il testo del suo intervento e per il continuo incoraggiamento a occuparmi di un "tema davvero bellissimo" come da lui stesso è definito. Qualche anno dopo l'intervento, il soggetto ha costituito il fulcro del capitolo *Macchine Francesi* in: C. Pedretti, *Leonardo & Io*, Milano, 2008, pp. 404-416.

2 L'abbozzo di lettera si legge al folio 317 r-b [872 r] del Codice Atlantico. Si veda: *Leonardo da Vinci: i documenti e le testimonianze contemporanee*, a cura di E. Villata, presentazione di P.C. Marani, Milano, 1999, no. 256, pp. 221-223.

3 Il contratto ufficiale, preceduto da pagamenti piuttosto regolari, fu steso soltanto in data 4 maggio 1504. Per il contratto ufficiale si veda i seguenti contributi e la bibliografia ad essi relativa: *Leonardo da Vinci* (cit. n. 2), pp. 166-169; *Leonardo da Vinci. La vera immagine: documenti e testimonianze sulla vita e sull'opera*, catalogo della mostra (Firenze, Archivio di Stato, 19 ottobre 2005 - 28 gennaio 2006) a cura di V. Arrighi, A. Bellinazzi, E. Villata, Firenze, 2005, pp. 191-192.

4 Uno dei primi studi di *automata* di Leonardo che ci sono giunti si trova in un disegno giovanile databile entro il 1478: si tratta del famoso carro semovibile – probabilmente utilizzato durante le feste di corte o spettacoli teatrali o come il motore per un automa – studiato al folio 296 v-a [812 r] del Codice Atlantico. Si veda: *Leonardo da Vinci. I cento disegni più belli dalle raccolte di tutto il mondo, Macchine e strumenti scientifici*, a cura di C. Pedretti con l'assistenza di S. Taglialagamba, Firenze, 2014, n. 5, p. 43. Oltre al carro semovibile, gli automata più stupefacenti progettati da Leonardo furono il robot cavaliere e il leone meccanico. Fu Carlo Pedretti a descriverne per primo le loro straordinarie caratteristiche. Si vedano i due principali contributi: C. Pedretti, *The Codex Atlanticus of Leonardo da Vinci: a catalogue of its newly restored sheets*, New York, 1978-1979, vol. II, p. 26; C. Pedretti, *Leonardo architetto*, Milano, 1978, pp. 319-323. Molte sono le ipotesi circa il reale funzionamento dei robots: M.E. Rosheim, *L'automa programmabile di Leonardo*, XL Lettura Vinciana, Vinci, 2000; *Le macchine di Leonardo: segreti e invenzioni nei codici da Vinci*, a cura di M. Taddei e E. Zanon, testi di D. Laurenza, Firenze, 2005; M. Taddei, *I robot di Leonardo: la meccanica e i nuovi automi nei codici svelati*, Milano, 2007; L. Garai, *Il leone semovente*, in *La mente di Leonardo: nel laboratorio del genio universale*, catalogo della mostra (Firenze, Galleria degli Uffizi, 28 marzo 2006-7 gennaio 2007) a cura di P. Galluzzi, Firenze, 2006, pp. 276-279; M.E. Rosheim, *Leonardo's lost robots: with 203 images*, Berlino, 2006; L. Garai, *The automatic lion*, in *Leonardo da Vinci & la France*, catalogo della mostra (Amboise, Château du Clos Lucé-Parc Leonardo da Vinci, 24 giugno 2009-31 gennaio 2010) a cura di C. Pedretti, Poggio a Caiano, 2010, pp. 126-139; S. Taglialagamba, *Automations and Robotics by Leonardo da Vinci*, Poggio a Caiano, 2010; *Leonardo da Vinci. I cento disegni più belli* (cit. n. 4), n. 67, p. 133; S. Taglialagamba, *II. Gli automi*, in *Leonardo da Vinci. I cento disegni più belli* (cit. n. 4), pp. 188-199.

Per informazioni più dettagliate sul contatore d'acqua realizzato da Leonardo per Bernardo Rucellai rimando alla ricca bibliografia relativa alla nota 7.

5 Si veda: E. Battisti, G. Saccaro Battisti, *Le macchine cifrate di Giovanni Fontana*, Milano, 1984.

6 Milano, Museo del Castello Sforzesco, Artista Lombardo (attribuito), *Diavolo meccanico*, XVI-XVII, inv. Sculture lignee, 172. Si veda: C. Alberici, *Un automa del Museo Settala*, in "Rassegna di Studi e Notizie", 10, 1982, pp. 32-67; C. Alberici, *Aggiunte all'automa diabolico proveniente dal Museo Settala*, in "Rassegna di Studi e Notizie", 9, 1983, pp. 35-40; S. Bedoni, *Jan Brueghel in italia e il Collezionismo del Seicento*, Firenze-Milano, 1983; *Il museo di Manfredo Settala nella Milano del XVII secolo*, a cura di V. de Michele, L. Cagnolaro, A. Aimi, L. Laurencich, Milano, 1983.

7 Le straordinarie connessioni tra la famiglia dei Della Volpaia e Leonardo sono state "riscoperte" grazie a Carlo Pedretti che nel 1951 studiò e trascrisse i loro manoscritti più interessanti: il taccuino familiare conservato a Venezia (Biblioteca Nazionale Marciana, Mss. Ital., cl. IV, 41 [= Codice Marciano 5363]) e il codicetto sul famoso "Orologio dei Pianeti" di Lorenzo conservato a Firenze (Biblioteca Nazionale di Firenze, Codice Magliabechiano XIX, 90). Rimando ai suoi autorevoli contributi: *Il Codice di Benvenuto di Lorenzo della Volpaja*, in "Sapere", f.s., 15 aprile 1952, pp. 57-60; *I progetti di Leonardo per la macchina idraulica di Bernardo Rucellai*, in "Sapere", f.s., 15 aprile 1952, pp. 61-64; *La macchina idraulica costruita da Leonardo per conto di Bernardo Rucellai e i primi contatori d'acqua*, in "Raccolta Vinciana", 17, 1954, pp. 177-215; *Studi vinciani: documenti, analisi e inediti leonardeschi*, Ginevra, 1957, pp. 244-262; *Leonardo da Vinci. I cento disegni più belli* (cit. n. 4), p. 33. Rinvio, infine, anche al mio contributo, un tentativo di ricostruire la monografia della famiglia dei Della Volpaia, nato grazie al suo esempio e alla sua istigazione: *III. Gli orologi*, in *Leonardo da Vinci. I cento disegni più belli* (cit. n. 4), pp. 204-235.

8 È possibile ricostruire l'annosa vicenda della *Vergine delle Rocce* grazie ai numerosi documenti ad essa relativa. Tuttavia, a complicare la questione alcune fonti antiche attestano l'intenzione di volere inviare il dipinto a Massimiliano d'Asburgo attorno al 1493. Per la vicenda rimando ai seguenti contributi e alla bibliografia ad essi relativa: C. Vecce, *Leonardo da Vinci*, Roma, 1998, p. 262-264 e note relative; *Leonardo da Vinci: i documenti* (cit. n. 2), pp. 18-34; *Leonardo da Vinci. La vera immagine* (cit. n. 3), pp. 141-142.

9 Era dunque necessario un permesso che consentisse a Leonardo di recarsi a Milano per un breve soggiorno in modo da permettere all'artista di ritornare nella città gigliata per finire la *Battaglia di Anghiari*. Questo fu regolato da un atto rogato tra Leonardo e la Signoria di Firenze il 30 maggio 1506. L'accordo stabiliva che Leonardo si impegnasse a ritornare entro tre mesi e, in caso di inadempienza, di pagare una penale di 150 fiorini dei quali si fece mallevadore Leonardo Bonafè, spedalegno di Santa Maria Nuova dove Leonardo aveva depositato il suo denaro. Le condizioni iniziali però non furono mai rispettate. Si vedano i seguenti contributi e la bibliografia ad essi relativa: *Leonardo da Vinci: i documenti* (cit. n. 2), pp. 195-201e pp. 203-214; S. Taglialagamba, *Lettere diplomatiche, abbozzi autografi e epistole di altra mano: il "carteggio indiretto" di Leonardo da Vinci (1506-1513)* per gli atti del XXV Convegno Internazionale dell'Istituto di Studi Umanistici "F. Petrarca" tenutosi a Chianciano e Pienza dal 18 al 20 luglio 2013, attualmente in corso di stampa.

10 P.C. Marani, *Leonardo e Bernardo Rucellai fra Ludovico il Moro e Lorenzo il Magnifico sull'architettura militare: il caso della Rocca di Casalmaggiore*, in *Il principe architetto*, atti del convegno (Mantova, 21-23 ottobre 1999) a cura di A. Calzona, Firenze, 2002, pp. 99-112.

11 Per le notizie riguardanti il leone meccanico, rimando alla bibliografia alla nota 4.

12 *The Literary Works of Leonardo da Vinci*, compiled and edited from original manuscripts by J.P. Richter, 2nd ed. enl. and rev. by J. P. Richter and I. Richter, London-New York-Toronto, 1939, 2 voll., § 1048.

13 Cf. *The Literary Works* (cit. n. 12), § 1073.

14 Si veda il contributo, con il quale si accede anche alla bibliografia precedente, di: S. Frommel, *Leonardo and the Villa of Charles d'Amboise*, in *Leonardo da Vinci & France*, catalogo della mostra (Amboise, Château du Clos Lucé-Parc Leonardo da Vinci, 24 giugno 2009-31 gennaio 2010) a cura di C. Pedretti, Poggio a Caiano, 2010, pp. 117-125.

15 *Leonardo da Vinci & France* (cit. n. 14), pp. 73-74.

16 Si veda M. Rosheim, *Leonardo's bell ringer*, in M.E. Rosheim, *L'automa programmabile* (cit. n. 4), pp. 115-157.

17 Los Angeles, Getty Museum, GRI Library, Special Collections, Gilles Corrozet, *La historia di tvtte le città, ville, fivmi, fonti, e altre cose notabili della Franza, & di tutti i re di quella. Tradotta dalla lingua franzese nella italiana*, In Vinegia, per Michele Tramezzino, 1558, DC23.C6716 1558.

18 Cf. *Leonardo da Vinci. I cento disegni più belli* (cit. n. 4), p. 31.

Fig. 1. *Wollaton Hall, North side*, 2011, by the author.

Geometry and botany artistically united at Wollaton Hall at the end of the 16th century

Michael Simonsen

A garden represents the ideas and the knowledge an era has about nature; its design in terms of its shape and plants selection is based on the scientific knowledge of this particular time frame. But to merely associate representative or functional purposes with it does not go far enough, especially in a time in which the interweaving of different natural sciences, ideas and motivations was reflected in one person and one construction project.

Wollaton Hall, built between 1580 and 1588 in Nottingham in England is, with its preserved stands, building structure and relative documents, a distinctive model of the development of architecture in the time of Queen Elizabeth I (1533-1603). This example shows how architectonic and landscape gardening models immigrated and conjoined with local traditions – on the one hand to a certain extent delayed, but on the other hand with high intensity. In my essay the state and situation of the garden around the building at the time of the builder's generation will be portrayed with a glance towards the following generation and its contribution and deepening of botanical issues. Subsequently it will describe how geometry and botany are connected in the interplay with aesthetics and use. Moreover I will show how important observation in the garden was and still is to generate scientific knowledge.

Francis Willoughby, Robert Smythson - Phase I of the Garden - 1588-1618

In the middle of the 16th century, England was marked by the controversy with the Roman church and the secularization until the Elizabethan Religious Settlement, when Elizabeth I was confirmed 'Supreme Governor of the Church' in 1559.

The long-term peace period during her reign I fuelled and allowed a fresh boost to the development of the country. Elizabeth I neither directly promoted the arts, nor did she initiate any new building projects. Her policy, however, created the framework conditions for the blossoming of literature, art and architecture. The catholic aristocrats of this time in England had developed a taste for French buildings, particularly by Jacques Androuet du Cerceau (1510-1584). As they traditionally did not want to take the backseat to France, they began to show a greater interest in building in a similar style[1]. It was especially a group of influential and ambitious Puritans who entered into this architec-

tural competition with France. The publications by Sebastiano Serlio (1475-1554) and Jacques Androuet du Cerceau provided some orientation and input on the new architectural style, as well as French technology and design, which were imported through French masons who came over to England, like the sculptor Alan Maynard who worked with Robert Smythson at Longleat in Wiltshire[2].

Francis Willoughby

Francis Willoughby, the builder of Wollaton Hall, was born in 1546 as one of three children. His mother died in 1550 shortly after his father's death[3]. So Francis was taken care of by his guardian Francis Knolly (c.1514-1596) in Oxfordshire, where he grew up. Francis Knolly was an English minister under Elizabeth I and a nephew of the Duke of Suffolk, connected to the noble families Seymours and the Dudleys[4]. Willoughby went to school in London, Saffron Walden and at the Jesus College, Cambridge. In 1559 his older brother Thomas died, and Francis became the principal heir. He accepted the inheritance in 1564 when he turned 19[5]. At the age of 17 he married Elizabeth Littleton, daughter of his neighbour John Littleton of Frankley, Warwickshire (now Worcestershire)[6]. Because of the advantageous marriages of past generations Francis Willoughby had not only received the best classical education, he could also call himself owner of coal mines and land. He owned - among others - houses in London, Nottingham, Coventry and Kingsbury[7]. His education and character had greatly and mainly been influenced by a traditional and conservative way of living, thus the existing houses also continued to be kept in accordance with this mediaeval coinage far from the humanistic ideas widespread in the European élite at the time. At the age of 29 Willoughby held a reception for the Queen at his manor house in Middleton-Warwickshire on the 21st of July 1575[8]. Queen Elizabeth I connected this visit, arranged by Francis Knolly, with a little excursion from a festivity in Kenilworth 20 miles away, which possessed the most extensive alterations and embellishments at this time. Willoughby must have realized on that occasion that with his old-fashioned medieval manor houses in Middleton and Wollaton he was not in a position to provide sufficient and adequate places to entertain the Queen and her court. Francis Willoughby developed and turned into a "self-made man" of the countryside in a way that can be compared to the autodidact managers of the early 21st century as far as business-related involvement in coal mining, decision making and the search for further business areas is concerned[9].

His great ambition is reflected in the size of the house and in the location of the new hall. His high motivation and dedication to this project, as well as his interest in architecture and gardens are proven by the list of 16th century books he owned. His personal library included for instance the most famous architectural treatises at the time, in particular Vitruvius and Sebastiano Serlio's works, and the *Hortus academicus Lugduno-Batavus*[10].

Francis Willoughby met Robert Smythson in the 1570s, when he was already a mas-

ter builder[11]. Willoughby was probably so impressed by his works, above all the magnificent Longleat House built for Sir John Thynn, that he decided to involve Smythson in his plans for a new Wollaton Hall.

Robert Smythson

Robert Smythson, born in 1534 (1535), arrived in March 1568, at the age of 34, at the building site of Longleat[12]. By this time it is most likely he had finished his training as a journeyman and a master servant or sculptor. The only way to become a master was applying directly for a free master position to a building site[13]. Thus he was employed in Longleat at least as 'Parliere' or sculptor, if not as a master. Not only did he further develop new techniques during his twelve years at Longleat, he also further developed the existing design process to comply with the way gothic cathedrals were built[14]. In England, after the secularization of 1540, the building of large churches greatly decreased, and the structure and way of working at building sites changed. Among the main transformations, projects became smaller and the division and organisation of labour was more sub-divided into smaller units under a master builder.

However, the term 'master builder' existed and is still used nowadays, particularly with regard to smaller projects, depending on one person being responsible for all tasks, from the first drawings and drafts to the final hand over of the building key. It is most likely that Smythson's role in the building of the Wollaton Hall was probably similar. In the first half of the 20th century Mark Girouard, the architect's first biographer[15], showed academic prejudice, when he stated that Smythson was "no more than an ignorant local mason, with no intellectual training"[16]. Obviously, Robert Smythson's works and projects should not be compared with the works of 19th century-architects or the star architects of the 20th century. Especially the latter do not get their contracts to develop a solution for a specific place and its peculiarities; but they impose their distinctive 'branding' on the place and through this the investor feels ennobled. On the contrary, Smythson worked together with the mason Alan Maynard[17], who probably had a similar position with Sir Matthew Arundel, a Catholic, cousin and brother-in-law of Francis Willoughby, at Wolfeton House, Dorset[18]. Parallel to the project at Longleat, Smythson worked at Wardour Castle, Wiltshire in 1576[19].

However, Wollaton Hall was to become one of Smythson's most complex projects, which he supported until his death. Generally, the most ambitious building processes were based on and relied upon the client's or investor's recognition that they are indeed a cooperation and mutual enrichment between the architect and the client. In the case of Wollaton Hall this kind of cooperation between Willoughby and Smythson must have existed, influencing Francis Willoughby's original ideas and wishes.

The Grand Design

Wollaton Hall is situated on a hill and overlooks the countryside, located within the landscape dominating Nottingham Castle and St Mary's Church. For England and this time the location of a noble house on the top of a hill allowing such views of the surrounding landscape is absolutely unique. Neither similar important examples like Burghley and Longleat nor Ham House or Hatfield House are located in this way, which is more similar to Florentine villas, such as the Villa Medici in Fiesole (1457) or Villa Poggio Imperiale (1565). With a view to such a complex composition one always has to consider the unity between the house and its surrounding gardens and the landscape at large. To consider only one element on its own would lead to incomplete conclusions. From this perspective the parallel is also visible in the layout of the drawing by Androuet du Cerceau, which shows front service buildings, present in his *Livre d'architecture,* XXXV (1582)[20]. It shows a ground plan with four separate buildings with different functions on four sides.

It is interesting to see that the sable block and the gatehouse are on the same side of the house as in Smythson's plan, yet not as square in shape. Roy Strong mentions this completely symmetric four-partied plan of the house[21], and he underlines the outer buildings and gardens are unique for the late Elizabethan and Jacobean period. Indeed, Strong sees Wollaton as one of the most outstanding examples for the immense influence of French royals' and aristocrats' gardens.

The grid of the ground plan would, except for the terraces, even allow mirroring in the diagonal axes in North-South and East-West direction (see also Donato Bramante's plan for St. Peter's Basilica in Rome).

A possible opening ceremony of the Hall in 1588 is questionable. There is no doubt however, that Francis Willoughby did everything possible to impress, ultimately his Queen, and Francis Knolly, 74 at the time, would have been the most likely person to celebrate this place and to recommend the Queen visit it. Knolly might have been one of the very few guests who really experienced the original dramaturgy of the architecture and gardens and the greatness of the reception.

The main aim for building Wollaton Hall was to honour Queen Elizabeth I, hence it was conceived according to a spectacular architectural design. It included an increasing sequence of dramatic process, developed both horizontally and vertically. One of its main strategic effects was the sequence of small, narrow and dark rooms followed by large and light-flooded chambers. From the wide surrounding deer park, the visitor reached the staircase to the gatehouse. This only entrance then opened to a dark and narrow way up, followed by an opportunity to quickly refresh oneself and a room for the porter. Having arrived at the top of the staircase one entered a bright open forecourt. On each side of the forecourt, there was a high stone platform holding possibly up to 100 people, offering an unforgettable welcome to Wollaton. When walking between meadows towards the entrance of the building, the guest was softly led along the axial way upwards; the shaded facades appear even bigger now. Once inside, the environment

turned dark and narrow, because no grand entrance hall was planned. After having changed direction three times, one finally entered the main hall, a cathedral-like room, high and long. The upper windows filled with sunlight that illuminates a wooden ceiling record the one in Westminster Abbey's. The parallels with the late mediaeval hall of the typical Manor houses are still noticeable: from the hall a very narrow spiral staircase leads up to the party room above the hall. Once again, the path is conceived to bring to visitor from darkness to finally reach a room entirely surrounded by glazed 'walls'. The windows are tapered at their upper end and seem to be part of the hall below. This banquet room provides wonderful and wide views into the surrounding scenery; it was conceived for late nights gatherings after celebrations.

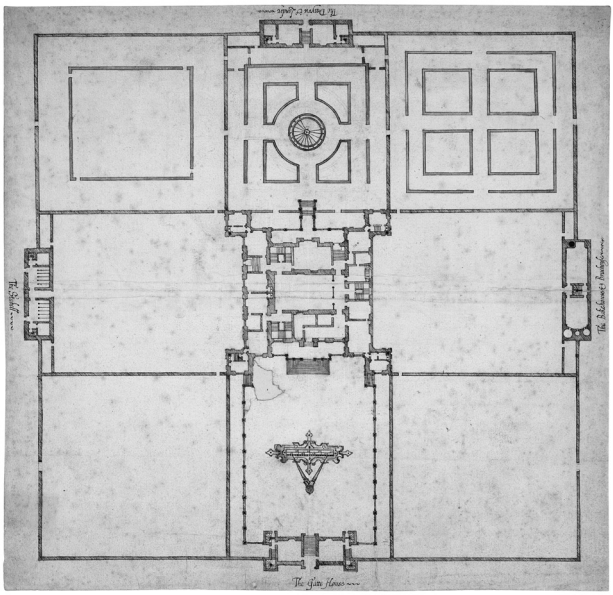


Fig. 2. Robert Smythson, *Ground plan of Wollaton Hall*, c.1590, London, RIBA, SC 231/I25(1).

Half way down the stairs, one could walk out on to the roof. A similar flat roof inspired by the Astronomer's Walk drafted for Theobald's House was realized in Burghley House. Robert Smythson worked in Burghley House between 1558 and 1587, therefore it is very likely to imagine he saw the drafts for Theobald's House, which was built between 1564 and 1585. That is the hypothesis of Trea Martyn, who also mentions Sebastiano Serlio's writings about a flat roof that could be used for the pleasure of looking out into the countryside, as a possible source of inspiration[22]. In Wollaton Hall, the prospect room and the separate Pavilions in the four towers can be entered from the roof. An interesting parallel with Hunting Castle Chambord can be observed: the roof terrace was there used by hunters, as well as the surrounding deer park. The mentioning of a single chaise in the North tower pavilion in the inventory of 1601 and the fireplace above Willoughby's chambers could also indicate that it was used for hunting[23]. That Chambord indeed influenced Smythson – thanks to Androuet du Cerceau's drawings of *Premier [et Second] volume des plus excellents bastiments de France... (1576)* –, is visible from the wagon-roofed and richly plastered ceiling of the long gallery in the Burton Agnes Hall in Yorkshire, built between 1601 and 1610[24], and the plaster ceiling of Chastleton House, in Oxfordshire[25]. Both can be compared with the ceiling of the main rooms in Chambord that can be reached from the double spiral staircase.

The long gallery at Wollaton, which is situated on the first floor and faces North-

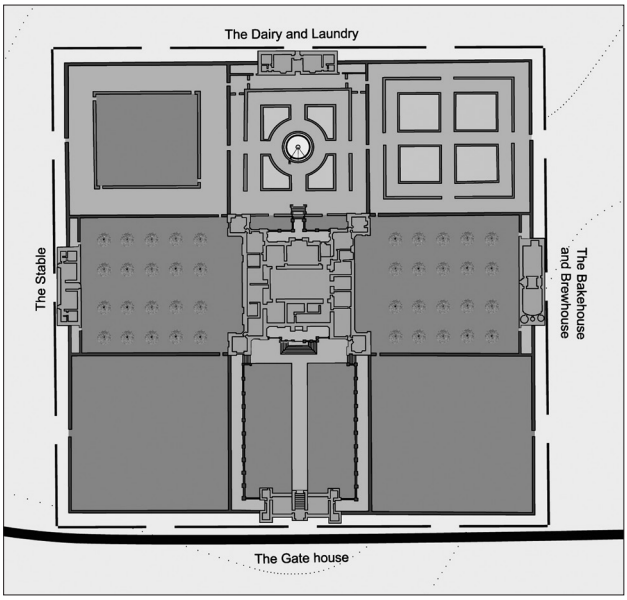


Fig. 3. Re-construction of the possible situation at Wollaton around 1590, by the author.

East, is another sign that Willoughby built according to state-of-the-art technology. There are three large glass facades that give access to direct dazzling sunlight, particularly in the morning, which is completely different to the medieval dark rooms with small windows. From this room one could overlook Willoughby's entire estate and surrounding lands, Nottingham town, Nottingham Castle and all the way south to the river Trent. The horizon seems ten to fifteen miles away. At the same level are the chambers for Queen Elizabeth. It was essential for the Queen that there was a sequence to the rooms, that they were connected and that especially the bedchamber had a view across the knot garden, which was the Queen's private garden[26]. To the west a similar sequence of rooms is located for the person accompanying the Queen. The big Eastern stairs lead down to the garden terrace and the wider garden similar to the forecourt.

In the shape of a Greek cross four yards are located around the building. In the North-West there is the entrance court already described. Opposite to it in the South-East there is the sundial yard as general garden with an entrance from the big stairs and a separate entrance from the *'Garden Stairs'*. Towards North-East and South-West more functionally oriented courts are located including connections to the stables and to the bakery. In the draft by John Thorpe (c.1565–1655?; fl.1570–1618), the note *'Orchard heare'* can be found for the yard leading to the stables. The South-East court is named *'Garden heare'*[27]. Even if at that time the term *'Orchard'* was used for fruit trees and vegetable gardens, this is an indication that there was definitely a kitchen garden located in the North-East court, and probably also in the South-West yard because of the presence of the bakery. There are four more courts in a squared shape directly linked to the tower houses of the building. According to Smythson's ground plan and its measurements, there was a bowling green in the western yard[28]. In the South, four square flower beds indicate the location of a knot garden. It is most likely that the courts in the North and the West were similarly used for pleasure. It remains speculation though, if it included a maze below the western king's chamber and below Francis Willoughby's rooms in the North. The outer walls, which, of course, were also there to protect, were probably at least two meters high. Whether this was also true for the inner walls cannot be known

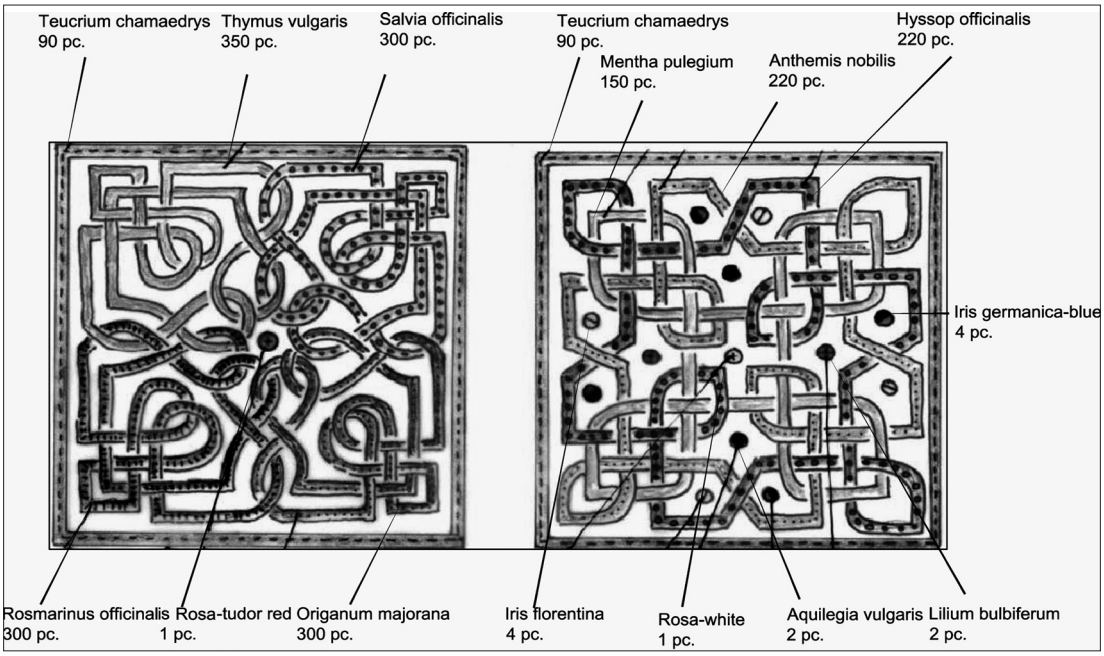


Fig. 4. Re-construction of a knot-design of the late 16th century, by the author.

from Smythson's drawings. With regard to Francis' mediaeval coinage the various garden rooms could have been surrounded by high walls, to recall the scheme of the *hortus conclusus*. Under the Queen's bedroom windows was a knot garden, also used for the cultivation of simples[29], following the mediaeval tradition. This in turn leads to the conclusion that the plants used and the shapes of the knots could not be compared to the ones used in the early 17th century - the plants then were box (Buxus sempervierens). In the *Hypnerotomachia Poliphili* by Francesco Colonna, published in 1499, and remained a reference for gardening models thanks to his illustrations and great diffusion all over Europe, four knot garden beds with plants and a partitioning also without box are described[30]. In the herbal book by William Turner (1568)[31] box is shown too, and its description details that the plant was not used for medical purposes, but the flowers make a bitter honey. Due to its unpleasant smell, box was not used in the enclosed English gardens in the 16th century - a proof of the important role played by the sense of smell in gardens of that period[32].

Buxus sempervirens was used on the outside around the knot quarters in France after 1595 according to Claude Mollet (1557-1647) in *Theatre des plans et jardinages*[33], and also in England in 1613 according to Gervase Markham (1568-1637) in *The English Husbandman.* Markham pointed out Buxus sempervirens and Ligustrum vulgare are the best hedges around the knot garden; in 1590 at Wollaton the knots were probably enclosed with Ligustrum and not box, for the reasons already mentionned[34].

The circular feature of the sundial court was thought to correspond to the still existing pond by P. Marshall[35] and M. Morris[36]. But following a hint by P. Henderson, P. Smith identified the feature in the middle as a sundial, which was very common at this time[37]. In the original plans the numbers 7, 8, 9, 10, 12, 1 are clearly visible and the number 12 is in line with the North axis of the garden[38]. Thus the sundial is clearly derivable, even if from our present point of view a diameter of about ten meters seems rather unusual. The four surrounding flower beds, also integrated into the knots, probably presented symbolic flowers like the white rose of York and the red one of Lancaster, the twelve Virtues in roses, the three Graces in pansies and the nine Muses in nine different types of flowers[39].

The Inventory of October 1601 (No. 35) describes that the gardener lived in the gardeners' chambers in the basement of the East tower of the house. The chambers had an external doorway to the sundial garden. The rooms could not be heated therefore they were used only as occasional accommodation. The external doorway was later blocked from the inside[40]. P. Smith argues with a view to the details of the ground plan that Smythson can only be attributed limited involvement in the garden design[41]. Then as now, much work was directly handed over to the gardener, who was also expected to be in charge of the planting and designing of the knots. With a view to the later garden designs by Robert Smythson for Ham House, Nonsuch Palace, Wimbledon House, Somerset House or Twickenham House[42] it seems that he began to focus on the garden much more after Wollaton.

Queen Elizabeth I was never to see the house and the garden. In 1588, when work at Wollaton was finally finished, the disputes between England and Spain became stronger and on the 9th of August Queen Elizabeth I held her famous speech in front of her troops[43]. Yet, the decisive blow against Spain in 1589 failed. Elizabeth had reached the age of 56, she had lost important companions and the years of travel and festivities had passed. The last years of Elizabeth I also presented the end of an era of art, social life, finance and English culture[44]. Francis Willoughby died after a short illness on 16th November 1596 in London[45]. The next generation, Percival and Bridget, moved to Wollaton Hall in August 1599[46]. They employed Robert Smythson for further works in London and the coal mines in Nottinghamshire[47]. In the night of June 21st 1603, only few days before the coronation of James I, the future queen, Queen Anne of Denmark, and her eldest son Prince Henry visited Wollaton Hall[48]. At last Robert Smythson was given the pleasure to experience the royal honour of his house. He died in October 1614 at the age of 77 in Wollaton - the place that had considerably influenced the second part of his life due to his work and the close and lasting relationship to Francis and, later, Percival Willoughby. Robert Smythson came to this position not as a painter architect like his colleagues in Italy, but he followed the path of a craftsman. He represents the transition in England from the status of a mediaeval master builder to a Renaissance architect, a process of professional recognition by society that occurred during the 16th century in Europe. Smythson's son and his grandson also became architects, who then built upon his achievements.

Francis Willughby (1635-1672), the naturalist

The following years were marked by the time of Stuart King James I (1566-1625) and his endeavours to build a kingdom of Great Britain. The Union Jack was introduced, and he had the bible translated into the English language in 1611. Percival's wife, Bridget Willoughby died in 1629. Francis Willughby, the later Naturalist Fellow of the Royal Society (F.R.S.), the great grandson of Francis the builder, was born as son of Francis Willoughby and Cassandra Ridgeway in 1635. After a fire in the Hall in 1642 and for forty-four years the great hall lay empty[49]. In the civil war time the Hall was garrisoned by parliamentary troops, and Wollaton was in parliamentary hands until the end of the war[50].

Francis Willoughby F.R.S. used the alternative spelling of 'Willughby', by which he is generally known. He was admitted to the Royal Society in 1661 and was elected as a fellow in 1663. An extract from the *Philosophical Letters* shows that close correspondence existed between Francis Willughby and John Ray (1625-1705) between 1659 and 1666[51]. In it Willughby and Ray exchange views on their intentions to catalogue the plants of England and travel reports about Europe. Francis' own experimental garden in Middleton is deductible. He died at Middleton on 3 July 1672 at the age of 37[52]. John Ray published his *Fasciculus Stirpium Britannicarum* (British pedigree file according to the plants found in England) in 1677 and dedicated it to Francis Willughby as his patron[53]. Just one year later Ray published *The ornithology by Francis Willughby* including a first order of birds with 78 tables on how to hunt and catch them in order to study them and other detailed descriptions[54]. Carl von Linné (1707-1778) founded with the *Systema Naturae* the modern taxonomy in 1735, which is still partially valid today. Catalogues by Willughby and Ray can be technically considered its forerunners, and they are linked to the endeavours to create a systemic order of flora and fauna[55].

It is said that Francis Willughby is at the origin of two avenues of oaks that led from the village to the Hall. These, which were definitely in accordance with the gardening style of the time, might have been created by Francis between 1664 and 1672 which would have been his only contact with Wollaton[56]. Nonetheless his achievements regarding the cataloguing of plants and animals and his support for this cataloguing probably played an important role for Wollaton Hall, if not in terms of an impact on the garden design, in terms of an owner's interest and a probable use as a naturalist.

Observations of natural phenomenon as part of the scientific process of learning in the garden

In the 16th century, the tendency was to be expert in more than one field of research: for example observing flora helped researchers to arrive to conclusions on fauna and vice versa. This is especially shown in the contemporary naturalistic drawings, for example by the French artist Jacques le Moyne de Morgues (1533-1588). Some of his draw-

Fig. 5. Jacques Le Moyne de Morgues, *Wild Strawberry and Female Emperor Moth,* c. 1575, London, Victoria & Albert Museum.
Fig. 6. Jacques Le Moyne de Morgues, *Daffodils* [nodding violet or wood violet] *and a Red Admiral Butterfly,* c. 1575, London, Victoria & Albert Museum.

ings conserved in the Victoria and Albert Museum in London reflect the connection between plants and butterflies as one possible outcome of such a combined or overlapping observation undertaken in the natural surroundings or the garden respectively[57].

It is the case of the Viola odorata (Wood Violet) and Fragaria vesca (Wild Strawberry), plants suited for the use in a knot garden, which were also an integral element of mediaeval gardens. Even if most of Le Moyne's drawings come from illustrations of earlier books, others are the result of a direct observation in nature, as the representation of imperfections and particularities show. The strangely sinuous form of the berries seems to indicate that this drawing of a wild strawberry is at the boundary between the living plant and a general outline derived from an earlier illustration by the botanist Leonhart Fuchs (1501-1556) and his *De historia stirpium commentarii* (1542, Basel).

The uniqueness of Wollaton Hall for England in the 16th century is illustrated by its location in the landscape and, furthermore, by the development of a unity of house and gardens, which was based on a geometrical system in the floor plan. The serial, rhythmical sequence of the chambers inside and the places outside plays with geometrical

contrasts, which offer a surprise effect, when you walk through them, that is even more intensified by the variations of light and shade. The mastery of the geometry which the viewer can observe is transferred to the mastery of the three-dimensional space.

In the garden areas behind the building the temporal and vegetative dimension is added, whereby the areas are separated and thus still oriented towards the mediaeval *hortus conclusus*. The area in the centre is structured by the sundial which allows an interaction between the temporal dimension and the geometrical floor plan, and breaks the static situation of the construction in the rhythm with the sun and the daytime. The planting that surrounds the sundial and the corner beds extends the diurnal into a seasonal dimension that can in turn be contextualized with the wandering shadow length of the sundial in the course of the months. To capture time and space beyond a particular situation is in the enduring interest of the sciences. However, the processes in nature and thus in the gardens are always unique: and the situation in the subsequent year will always be different. Only in the "Laboratory of the Garden" which plants and phenome-na can be perceived and documented part-by-part or cut-out-like, this uniqueness can be understood.

In the garden, underneath the window of the Queens chambers, the geometrical pattern of the square dominates: four squares as knot garden, framed by a square of hedges. The geometrical dimension is also mirrored in the contours of the particular plant species in a square. The exemplary re-construction illustrates the shape and possible species that might have been used.

At the end of the 16th century, Wollaton Hall shows, with its geometrical shape combined with properly and orderly arranged plantings, that gardens were and still are places that stimulated artistic creativity as well as nature observation. They allowed straightforward experiments based on direct observation which is the essence of modern science, and corresponds to Francis Willughby's work as a naturalist.

Notes

1 *Jacques Androuet du Cerceau, «un des plus grands architectes qui se soient jamais trouvés en France»*, exhibition catalogue edited by J. Guillaume, Paris, 2010.
2 Alan Maynard and Robert Smythson also worked for Sir Matthew Arundell at Wolfeton House in Dorset. See A.T. Friedman, *Wollaton Hall and the Willoughby family in the sixteenth century*. Doctor Thesis. University of Harvard, 1980, pp. 137-138.
3 *Middleton collection: Willoughby family biographies*, University of Nottingham. Available at: <http://www.nottingham.ac.uk/manuscriptsandspecialcollections/collectionsindepth/family/middleton/biographies/biographyoffranciswilloughby,2ndbaronmiddleton(1692-1758).aspx> [Accessed 19 February 2011] p. 6-Francis. The University of Nottingham holds the family collection in the Manuscripts and Special Collections at Kings Meadow Campus and offer short biographies and an overview of the archive collection online.
4 All three families are connected to the Royal Household. M. Girouard, *Robert Smythson. The Elizabethan country house*, New Haven-London, 1983, p. 83.
5 *Middleton collection* (cit. n. 3).
6 ibid.
7 P. Marshall, D. Taylor. *Wollaton Hall and the Willoughby Family,* Nottingham, 1999, p. 22.
8 A.T. Friedman, *House and household in Elizabethan England. Wollaton Hall and the Willoughby family,* Chicago-London, 1989, p. 24.
9 M. Girouard, *Robert Smythson* (cit. n. 4), p. 4.
10 Cf. *List of late 16th century books, late 17th century*, Middleton Collection - University Nottingham Mi I 17/1, p. 4. The list was drawn up by Cassandra Willoughby (1670-1735) the later C. Brydges, Duchess of Chandos and represents the wide field of books she found at Wollaton Hall, when she arrived in 1687.
11 A.T. Friedman, *Wollaton Hall* (cit. n. 7), p. 130.
12 M. Girouard, *Robert Smythson* (cit. n. 4), pp. 45-46.
13 G. Binding, *Baubetrieb im Mittelalter, edited by* G. Annas, B. Jost and A. Schunicht, Darmstadt, 1993, p. 292.
14 M. Girouard, *Robert Smythson* (cit. n. 4), p. 41.
15 Mark Girouard (born 1931) is a British architectural Writer. He was appointed as a Slade Professor of Oxford University in 1975-1976.
16 Ibid. p. 107.
17 A.T. Friedman, *Wollaton Hall* (cit. n. 8), p. 130.
18 Ibid. pp. 137-138.
19 M. Girouard (cit. n. 4), p. 78.
20 J. Androuet du Cerceau, *Livre d'architecture*, Paris, 1559, XXXV.
21 R. Strong, *The Renaissance garden in England*, reprint, London, 1998, p. 57.
22 T. Martyn, *Elizabeth in the garden. A story of love, rivalry and spectacular design,* London, 2008, p. 123.
23 P. Marshall, D. Taylor, *Wollaton Hall and the Willoughby Family,* Nottingham, 1999, p. 66.
24 M. Girouard, *Robert Smythson* (cit. n. 4), p. 186.
25 P. Henderson, *The Tudor house and garden. Architecture and landscape in the sixteenth and early seventeenth centuries,* New Haven-London, 2005, p. 219.
26 R. Strong (cit. n. 21), p. 49.
27 J. Thorpe, *Drawing about Wollaton Hall,* 1596-1603, Sir John Soane's Museum, catalogue number T 29.
28 P. Smith, *The sundial garden and house-plan mount at Wollaton*, in "Garden history", 31(1), 1-28, 2003, p. 6.
29 H.J. Harvey, *Mediaeval gardens,* London, 1981, p. 80.
30 F. Colonna, *Hypnerotomachia Poliphili, Wunsiedel*, (1499), edited by T. Reiser, 2014, pp. 460-467.
31 W. Turner, *The first and seconde partes of the Herbal of William Turner,* Collen, 1568.
32 R. Whalley, A. Jennings, *Knot gardens and parterres. A history of the knot garden and how to make one today,* London, 1998, p. 53.
33 C. Mollet, *Théâtre des plans et jardinages. Contenant des secrets et des inventions incognues à tous ceux qui jusqu'à présent se sont meslez d'escrire sur cette matière ; avec un traicté d'astrologie*, Paris, 1652, p. 202.
34 G. Markham, *The English Husbandman*. London, 1613, p. 120.
35 P. Marshall, D. Taylor, *Wollaton Hall* (cit. n. 23), p. 48.
36 M. Morris, A. Wallace, *A Conservation Plan for Wollaton Hall and Park.* Nottingham. August 2002. Middleton Collection - University Nottingham Not 4HD64 HAL, 2002, pp. Appendix 7-10.
37 P. Smith, *The sundial garden* (cit. n. 28), pp. 6-7.
38 R. Smythson, *Garden plan. Wollaton*, c. 1590, RIBA, Drawing Collection SC 231/I/25 (1) Plan.
39 R. Strong, *The Renaissance garden* (cit. n. 19), p. 46.
40 P. Marshall, D. Taylor, *Wollaton Hall*, (cit. n. 23), pp. 79-81.
41 P. Smith, *The sundial garden* (cit. n. 28), p. 6.

42 P. Henderson, *The Tudor house and garden. Architecture and landscape in the sixteenth and early seventeenth centuries,* New Haven-London, 2005, figures 22, 111, 122, 123, 124.

43 The Queen's speech to the troops at Tilbury in Essex was held in preparation for the invasion by the Spanish Armada to change the Protestantism in England.

44 A.T. Friedman, *House and household in Elizabethan England. Wollaton Hall and the Willoughby family,* Chicago-London, 1989, pp. 51-52.

45 P. Marshall, D. Taylor, *Wollaton Hall* (cit. n. 23), p. 83.

46 Ibid, p. 88.

47 M. Girouard, *Robert Smythson* (cit. n. 4), p.166.

48 P. Marshall, D. Taylor, *Wollaton Hall* (cit. n. 23), p. 89.

49 Ibid. p. 96.

50 R.S. Smith, *Sir Francis Willoughby of Wollaton Hall.* Nottingham, 1988, p. 49.

51 J. Ray, W. Derham, F. Willoughby, *Philosophical Letters between … Mr Ray and several of his … Correspondents … to which are added those of F. Willughby … The whole consisting of many curious discoveries and improvements in the History of Quadrupeds, Birds, … &c. Published by W. Dernham.* pp. 376. W. & J. Innys: London, 1718, pp. 10-13.

52 *Middleton collection* (cit. n. 3).

53 J. Ray, *Fasciculus Stirpium Britannicarum, post editum Plantarum Angliæ Catalogum observatarum,* London, 1688, p. A2.

54 J. Ray, *The ornithology of Francis Willughby of Middleton in the county of Warwick Esq, fellow of the Royal Society. In three books,* London, 1678.

55 cf. J. Ray, *Catalogue of English plants,* 1668; J. Ray, *New method of plants,* 1682; J. Ray, *Collection of European plants,* 1694

56 *Rambles Round Nottingham. A Series of Successive Visits. To Villages - Places - Seats etc,.* London, 1856, Vol. I, p. 57.

57 On this artist see the recent publication by Harvey Miles: H. Miles, *Painter in a savage land: the strange saga of the first European artist in North America*, New York, 2008, and the work of Paul Hutton, P. Hutton, *The Works of Jacques Le Moyne de Morgues, A huguenot artist in France, Florida and England*, Oxford, 1977, The Trustees of the British Museum, 2 volumes.

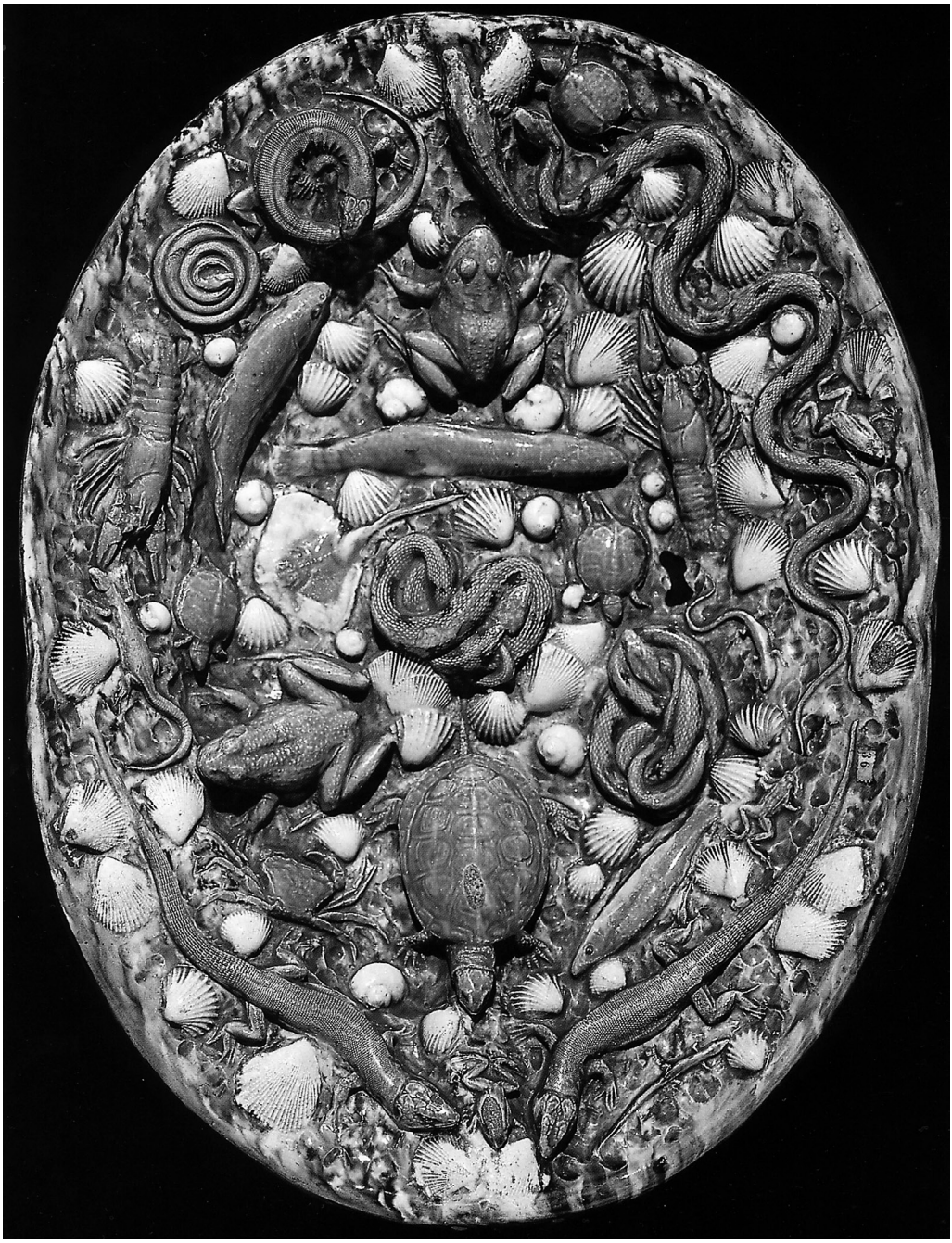


Fig. 1. Bernard Palissy, *Plat à décor rustique*, deuxième moitié du XVI^{e} siècle, Paris, Musée du Louvre.

Placere et docere: le jardin minéral de Bernard Palissy

Juliette Ferdinand

> Quelque fois je cerchois des cailloux, pour faire de l'esmail, et des pierres artificielles: or apres avoir assemblé un grand nombre desdits cailloux, en les voulant piler, j'en trouvay une quantité qui estoyent creux dedans, où il y avoit certaines pointes, comme celles de diamant, luisantes, transparentes, et fort belles: alors je me commençay à tormenter, pour savoir qui estoit la cause de cela, et ne le pouvant entendre par Theorique, ne Philosophie naturelle, il me print desir de l'entendre par pratique (…)[1].

Le passage cité en prélude du présent essai introduit idéalement notre réflexion, car il décrit le *modus operandi* du céramiste Bernard Palissy, en évoquant clairement la fusion qui entre la recherche artistique et scientifique s'y joue. Le phénomène décrit par ce précieux témoignage sera ici analysé grâce au projet de jardin exposé par l'auteur dans le volume intitulé *Recepte véritable* publié en 1563 à la Rochelle[2]. Nous verrons en quels termes le célèbre principe horatien énoncé dans l'*Ars Poetica*, c'est à dire "instruire et plaire", est illustré dans cette création à travers un parcours graduel qui va du plaisir esthétique vers le savoir scientifique, avec pour but ultime d'atteindre la Sapience, c'est-à-dire pour Palissy une foi profonde dans le Créateur.

La vie de Bernard Palissy couvre quasiment tout le XVI[e] siècle : né probablement à Agen en 1510[3] et mort emprisonné à la Conciergerie à Paris en 1590, il est l'une des nombreuses figures d'homme « universel » qui caractérisèrent le XVI[e] siècle européen. Il débuta sa carrière artistique comme peintre sur vitrail puis géomètre, professions qu'il abandonna progressivement pour se dédier à la céramique dans les années Quarante. Le potier se revendiquait en outre philosophe naturel, publiant ses opinions en matière de géologie, agronomie, hydrologie et métallurgie dans deux volumes: la *Recepte véritable* (1563), et les *Discours Admirables* (1580).

Son talent artistique fut remarqué par l'élite française qui admirait l'inimitable vaisselle rustique dédiée à la représentation du milieu marécageux typique de sa région, la Saintonge, située dans le Sud Ouest de la France. Ces inventions – comme il aime à les revendiquer – (Fig. 1) connurent un succès tel qu'elles lui permirent d'obtenir les plus prestigieuses commandes, en particulier deux grottes émaillées; la première destinée au Connétable Anne de Montmorency[4], la seconde désirée par la reine Catherine de Médicis elle-même à la fin des années 1560[5].

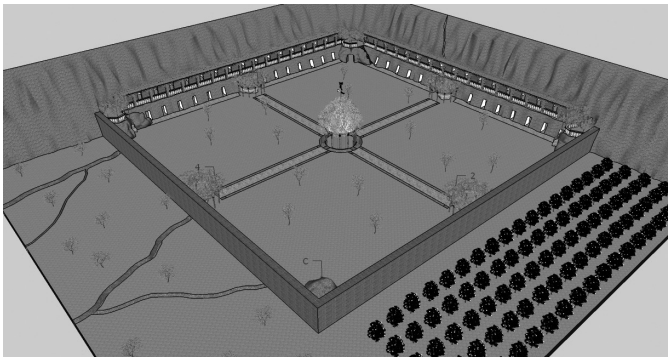


Fig. 2 . Restitution axonométrique du jardin de Bernard Palissy par Stefania Monteleone.

Palissy a été l'objet de nombreuses études, mais son œuvre soulève encore bien des interrogations. Après plus de deux siècles d'oubli, au dix-neuvième siècle l'artiste fut l'objet de recherches de caractère archivistique et biographique de la part d'érudits saintongeais, dont les découvertes ont permis de mieux en connaître la vie et la carrière. Mais ce n'est que lors des trente dernières années – exception faite de l'ouvrage pionnier d'Ernst Kris publié en 1922[6] – que s'ébaucha une véritable réflexion sur ses réalisations plastiques. Avec les fouilles archéologiques des Tuileries réalisées en 1984-85 qui mirent en lumière l'atelier de l'artiste et des milliers de fragments de céramiques, de moules et d'outils[7], s'éveilla un regain d'intérêt pour les créations aussi virtuoses que naturalistes de celui qui devint le potier de la cour, et plusieurs publications fondamentales virent le jour, de l'édition critique des *Œuvres Complètes* dirigée par Marie-Madeleine Fragonard[8], à la monographie de l'historien d'art Leonard N. Amico[9].

Palissy présente la caractéristique aussi rare que précieuse d'avoir laissé à la postérité à la fois des œuvres figuratives – malheureusement souvent fragmentaires[10] – et des écrits traitant de sujets très divers parmi lesquels de nombreux passages font écho aux créations céramiques. Ainsi le rapprochement entre les textes et les objets permet de mieux comprendre la démarche du potier, en particulier l'intense dialogue établi entre la recherche artistique et la curiosité scientifique. Le projet de jardin exposé dans la *Recepte véritable* expose clairement ce lien étroit entre l'approche du naturaliste et celle du céramiste, en particulier par la place accordée au règne minéral, présent aussi bien de manière artificielle grâce à l'imitation, que de manière naturelle avec l'insertion d'exemplaires authentiques. La majeure partie du texte est en effet dédiée non pas, comme on pourrait s'y attendre, au choix des plantes qui constituent habituellement l'essence d'un jardin, mais à la description des neuf pavillons qui ornent celui-ci.

Le plan du jardin est décrit de façon assez précise : il est situé au bas d'une colline – que l'auteur appelle le « rocher ou montagne »[11] –, et délimité par une "quadrature", c'est à dire un espace quadrangulaire, partagé en quatre parties d'égales dimensions séparées par une allée cruciforme. À chaque extrémité de l'allée et aux angles du mur d'enceinte s'élèvent des "cabinets", c'est-à-dire des pavillons ornementaux entièrement réalisés en céramique et alimentés par des canalisations provenant du cours d'eau qui descend de la montagne: quatre sont érigés aux angles de l'enceinte quadrangulaire, quatre aux extrémités des branches de l'allée cruciforme qui divise l'ensemble, et enfin le dernier est situé sur un îlot central (Fig. 2).

Les pavillons ou "cabinets" situés aux quatre angles sont semblables à des cavernes, dont Palissy désire reproduire parfaitement l'apparence minérale. Les grottes artificielles connaissaient alors un grand succès chez les riches commanditaires français, sous l'impact des réalisations italiennes qui se diffusèrent pendant tout le XVI[e] siècle[12]. Faire construire une grotte dans son jardin était à l'époque un acte riche de sens : ce type de construction, originairement dédié aux muses, remonte à l'époque hellénistique et s'affirma pleinement à l'époque romaine, au moment de la construction de jardins et espaces ouverts. À l'époque moderne, les références sacrales aux nymphes disparaissent et les grottes acquièrent un caractère récréatif tout en devenant un signe ostentatoire du prestige du commanditaire. En posséder un exemplaire permettait en effet aux propriétaires de s'inscrire dans la lignée de la culture antique puisque les descriptions suggestives de grottes et antres illusionnistes faites par Ovide[13], Apulée[14] ou Pline l'Ancien[15] les rendaient partie prenante de la *Renovatio Antiquitatis* si chère aux humanistes.

Les antres étaient presque toujours agrémentés par la présence de sources ou de fontaines dont la fraîcheur permettait de fuir la chaleur estivale dans un pittoresque abri, un lieu mystérieux et propice à l'exposition de « merveilles » naturelles et artificielles, situé à la frontière du songe. L'objectif des architectes était en effet de susciter l'illusion de franchir réellement le seuil d'un milieu rocheux – les murs par exemple, étaient réalisés avec des matériaux rustiques pour imiter l'irrégularité de la pierre nue – à l'intérieur duquel cependant, à côté d'éléments de provenance naturelle comme les stalactites ou les coquilles, étaient placées de véritables œuvres d'art, souvent de sujet mythologique[16]. Les systèmes hydrauliques nécessaires à l'alimentation des grottes en eau étaient en outre le résultat d'opérations d'ingénierie complexes et raffinées à travers lesquelles l'artisan devait éclipser au mieux sa propre intervention afin d'atteindre une parfaite imitation des phénomènes naturels.

La démarche de Palissy s'inscrit dans cet engouement au point de faire des grottes les principaux protagonistes de son jardin, offrant une variété de typologies qui rattache cette description à un « livre de modèles » qui serait alors unique en son genre[17].

Toutefois ces réalisations offrent plusieurs caractéristiques originales : le manque total de référence aux mythes ou à l'histoire antiques; le caractère exclusivement naturaliste qui en découle, et l'indépendance de ces bâtiments[18]. Ces traits sont absolument originaux dans la France de l'époque, puisque les grottes précédentes ou contemporaines étaient habituellement intégrées à un édifice architectural plus vaste et comportaient toujours des références aux mythes classiques[19]. Pour avoir une idée de l'aspect que pouvait avoir les grottes imaginées par Palissy, nous devons plutôt nous tourner vers l'Italie, avec par exemple la grotte de Cupidon réalisée par Bernardo Buontalenti (1531-1608) vers 1577 dans le jardin de Pratolino, dont l'extérieur est particulièrement rustique et qui, indépendant de tout bâtiment, s'intègre en revanche dans la nature des alentours[20]; une autre grotte très intéressante pour notre analyse des réalisations palissiennes est la grotte projetée par Cristoforo Sorte (1510-1595), un cartographe et artiste véronais, pour le jardin de la demeure des Porto, à Thiene près de Vicence, en 1580 (Fig.

Fig. 3 . Cristoforo Sorte, *Grotte rustique*, 1580, Thiene, Castello Porto Colleoni, photo de l'auteur.

3) La grotte, érigée au centre d'un bassin ou « peschiera », a une forme elliptique percée de huit ouvertures, et présente des parois d'un naturalisme extrême aussi bien à l'intérieur qu'à l'extérieur. Nous verrons plus loin comment, outre leurs affinités stylistiques, les deux cas offrent bien des points de comparaison dans leur conception même.

Si l'extérieur des cabinets d'angle est donc original pour l'époque – les exemples que nous avons cités pour leur apparence rustique sont en tous les cas plus tardifs –, l'intérieur des cabinets d'angle est véritablement inédit, et seul le texte de l'artiste et les quelques fragments retrouvés dans l'atelier parisien des Tuileries peuvent nous permettre d'en avoir une idée (Fig. 4). Palissy explique qu'il conçoit l'intérieur de ses grottes comme une explosion de couleurs obtenue par l'usage de l'émail, cuit grâce à une technique pour le moins surprenante. Le céramiste entend allumer un grand feu qui permettra de faire fondre les émaux de manière aléatoire, afin d'imiter au plus près les veines des pierres qu'il avait observées dans la Nature, et par là l'œuvre de la *Natura naturans,* c'est-à-dire la Nature dans l'acte de créer, un concept cher aux artistes de la seconde moitié du XVI^{e} siècle. Il faut insister sur le fait que dans ces cabinets d'angle aucune es-

pèce minérale authentique n'est utilisée, puisqu'au contraire l'artiste désirait y imiter la beauté des pierres en recourant uniquement à son art de terre, se fiant à la spontanéité du feu pour en reproduire les dessins naturels. Chaque cabinet a ses propres caractéristiques esthétiques et naturalistes : le premier cabinet imite la calcédoine, le porphyre et le jaspe; le second doit reproduire la transparence des pierres cristallines; les derniers imitent des mines dont la couleur dominante est le blanc avec des taches multicolores, toujours inspiré par l'aspect du jaspe. Les qualités chromatiques des pierres artificielles sont en outre exaltées par le ruissellement de l'eau qui affleure le long des parois les faisant miroiter. Nous avons la chance d'avoir à disposition quelques exemplaires de pierres réalisées par Palissy, retrouvées lors des fouilles, et force est de constater la parfaite maitrise de l'artiste dans cet art illusionniste (Fig. 4 et 5)[21].

Fig. 4 . Bernard Palissy (atelier de), *Brique à alvéoles multiples,* Ecouen, Musée national de la Renaissance.

Une lecture attentive ne peut manquer d'associer les pierres citées par Palissy à celles qui apparaissent de manière récurrente dans le *Songe de Poliphile*, un texte italien publié en 1499 chez Aldo Manuzio à Venise sous le titre d'*Hypnerotomachia Poliphili*, qui connut un immense succès en France dans la traduction de Jean Martin illustrée par Jean Goujon, publiée par Jacques Kerver en 1534[22]. Cet ouvrage narre le parcours initiatique d'un jeune noble, Poliphile, en quête de sa bien aimée Polia, avec forces détails sur les édifices hautement symboliques qu'il rencontre sur son chemin. Ces descriptions architecturales ont été à l'origine de bien des réalisations dans les jardins du XVI^{e} siècle, en particulier en France. Elles ont en outre indéniablement inspiré le jardin de notre céramiste, comme l'ont démontré Gilles Polizzi et Franck Lestringant[23], que ce soit pour le rôle conféré aux inscriptions qui ponctuent le parcours et le caractère illusionniste des fontaines, ou comme nous l'avons observé, pour l'usage des mêmes espèces minérales: jaspe, porphyre et cristal qui sont les pierres plus souvent citées pour décrire les bâtiments rencontrés par le héros[24].

Cependant, considérer ces correspondances entre les deux textes comme une simple reprise d'un *topos* littéraire serait sans aucun doute extrêmement superficiel au regard de la densité de la narration offerte par le céramiste saintongeais. Comme nous l'avons dit, la majeure partie de ses écrits est dédiée à ses considérations dans le domaine des

Fig. 5 . Bernard Palissy (atelier de), *Brique à imitation de pierre*, Sèvres, Musée National de la céramique.

sciences naturelles, et une part consistante concerne justement la formation des pierres et leurs propriétés. Or les pierres présentes dans les grottes apparaissent non seulement dans la description du jardin, mais dans le passage de la *Recepte* qui expose les convictions palissiennes quant à la formation des minéraux, une question fondamentale dans le débat scientifique de l'époque. L'artiste y expose sa conception du monde en relation avec la présence dans la terre de divers sels, qu'il considère être le cinquième élément indispensable « sans lequel nulle chose ne pourroit dire je suis»[25]. Selon cette vision de l'univers comme un système en continuel mouvement – une conception partagée par de nombreux penseurs de l'époque[26] –, l'eau, en pénétrant dans la terre, s'imprègne des sels qui composent le sous-sol et en devient le principal vecteur, transmettant leurs propriétés aux éléments rencontrés: l'odeur, le goût, les couleurs, leur essence même dépendent des sels transportés par les eaux[27].

Cette théorie permet à Palissy d'expliquer le processus de formation des pierres : à l'origine les minéraux sont des eaux de type « congélatif », c'est-à-dire chargées de sels qui engendrent leur solidification progressive. Les différentes caractéristiques des sels contenus dans ces eaux pétrifiantes confèrent aux minéraux leur apparence : l'artiste donne les exemples de la topaze, produite selon lui par le contact de certaines sources d'eau avec des terres ferrugineuses, dont elles prennent la couleur jaune, et en assument la grande dureté. L'émeraude doit quant à elle sa couleur verte aux terres chargées d'airain qui lui ont transmis leurs sels, la turquoise et le saphir leur couleur bleue aux sels de bronze et de cobalt présents dans la terre[28]. Les veines de la calcédoine et du jaspe sont selon lui le fruit d'un double processus : il s'agit d'abord de la rencontre entre de l'eau et des terres riches de minéraux, qui au moment de se pétrifier entre en contact avec des gouttes d'eau chargées d'autres sels, qui en durcissant génèrent à leur tour diverses couleurs ou "idees" comme l'artiste les appelle[29]. Le cristal dérive quant à lui d'une espèce de sel particulièrement rare, à l'origine de sa grande solidité. Les exemples donnés par le céramiste correspondent précisément aux spécimens qu'il entend utiliser pour orner ses cabinets, illustrant clairement la convergence entre la recherche artistique et scientifique.

La formation des minéraux est un sujet récurrent dans l'histoire des sciences natu-

relles. Déjà évoquée par Aristote, la question généra un débat qui se développa de manière sensible pendant le Moyen-âge puis à nouveau pendant la Renaissance, encouragé par le développement de l'agriculture et de l'extraction minière qui suscitèrent de nouvelles recherches dans les domaines de la métallurgie et de la minéralogie. Bernard Palissy s'inscrit dans cette longue tradition quand il évoque le pouvoir de l'eau « congélative » à la base de toute matière : « Il y a deux eaux, l'une exalative & l'autre congélative & germinative. (…) Par l'action de l'eau congélative les corps de l'homme & de toutes bestes & de toutes plantes se peuvent réduire en pierre. »[30] L'idée d'une substance aqueuse qui engendre les minéraux par « congélation » avait déjà été théorisée par Albert le Grand (1200 ca-1280) dans le *De mineralibus* daté de 1250, qui expose l'action de la « virtus lapidum generativa » par un processus de « congelatio » qui produit les pierres. Plus proche de notre artiste, Georgius Agricola (1494-1555) reprend cette thèse dans le *De Ortu et causis subterraneorum* – publié en 1546 en latin à Bâle[31] –, qui mentionne un « jus congelé » ou « jus apte à devenir pierre »[32] très semblable à l'eau pétrifiante évoquée par Palissy.

Revenons à présent au jardin minéral. Dans les grottes décrites l'eau est omniprésente puisque chaque pavillon est alimenté par la source située sur la montagne qui longe le jardin, et affleure le long des parois, baignant l'émail pour en augmenter la brillance. Palissy ne mentionne pas sa théorie sur l'eau pétrifiante à l'intérieur de la description du jardin, mais c'est un fait que les pavillons mettent en scène l'interaction entre l'eau et les divers types de minéraux. Sans pouvoir affirmer de manière certaine que l'intention de Palissy ait été celle d'illustrer ses propres théories, il est clair qu'il les avait bien à l'esprit au moment de concevoir ces créations, qui représentent à tous points de vue des microcosmes animés par les échanges entre les éléments: feu, terre, eau[33], au cœur de ses recherches.

La citation initiale exprime clairement par quel processus la pensée de philosophe naturel de Palissy trouve son fondement dans sa pratique artistique, qui constitue à son tour une source d'inspiration pour ses créations. Le travail de la céramique le porte à s'intéresser aux minéraux d'un point de vue esthétique, parce qu'il fabrique des pierres artificielles en terre cuite par la technique du moulage d'après nature. D'après ses écrits, c'est l'apparence de certaines pierres qu'il désire imiter, qui le pousse à réaliser des expériences de caractère scientifique afin d'en comprendre l'origine. Nous retrouvons cette convergence dans la description de la cuisson de l'émail à l'intérieur des grottes, qui dérive aussi bien de sa pratique de peintre sur verre que de ses expériences scientifiques. Il écrit en effet dans la *Recepte*:

> […] quand il est mis en une fournaise extremement chaude, comme les fournaises à faire chaux ou verre, ou autres telles fournaises, esquelles le feu est extremement violent, lesdits cailloux se vienent à vitrifier d'eux-mesmes, sans aucune mixtion, qui est une attestation bien notoire, que les cailloux ont en eux grande quantité de sel […].[34]

Dans ce cas Palissy a recours à un four de verrier, qu'il avait utilisé pour la cuisson de

ses céramiques[35], pour conduire une expérience de caractère scientifique afin de prouver la présence de sel dans les pierres. Notons ici l'analogie avec la technique inédite de cuisson de l'émail dans les grottes: il s'agit également de soumettre des pierres – de céramique – à une chaleur intense, transformant le cabinet en un véritable four qui permettra d'obtenir des coulures d'émail qui en se vitrifiant imitent les veines naturelles des minéraux.

Ces exemples illustrent comment dans le cas de Palissy l'atelier de l'artiste pouvait revêtir la double fonction de laboratoire à la fois créatif et scientifique, dans lequel les expériences deviennent des sources d'inspiration et des techniques de réalisation, et génèrent le savoir qui garantissait à Palissy une place de choix au sein d'un réseau d'amateurs de philosophie naturelle.

L'étroite relation existante entre l'art et la science dans les grottes de la Renaissance de la seconde moitié du XVI[e] siècle a été évoquée *in primis* par Detlef Heikamp à propos des jardins de Pratolino et Boboli, ouvrant la voie à l'interprétation des antres comme un reflet indirect des théories scientifiques de l'époque[36]. En effet, à partir de la moitié du XVI[e] siècle, les grottes ne sont plus exclusivement dédiées à des thèmes humanistes, mais elles proposent des solutions naturalistes très élaborées, qui utilisent aussi bien les *naturalia* que les *artificialia*[37]. D'après ce que nous avons mis en évidence, Bernard Palissy se place parfaitement au sein de cette tendance. Toutefois, si le fait de représenter les phénomènes et les beautés naturelles dans une grotte ne constitue par un *unicum*, le fait que ce soit l'artiste lui-même qui expose ses théories scientifiques dans le même volume que son projet artistique est en revanche exceptionnel.

Un rapprochement saisissant peut tout de même être fait avec un contemporain de Palissy déjà cité, le cartographe et peintre véronais Cristoforo Sorte[38]. Tous deux ont été employés comme topographes, Palissy pour faire les relevés des marais salants de sa région lors des révoltes de la Gabelle (1543), et Sorte pour faire la carte des territoires de la République de Venise[39]. Ils ont également écrit chacun un traité sur l'origine des fleuves : Palissy publia le *Traité des eaux* dans le recueil des *Discours Admirables* (1580)[40], et Sorte rédigea vers 1560 le *Trattato dell'origine dei fiumi* (non publié). Palissy réalisa la grotte du Connétable de Montmorency, conçu les grottes du jardin de la *Recepte véritable*, et fut appelé par la reine Catherine de Médicis pour réaliser la grotte du jardin des Tuileries, alors que de son côté Sorte réalisait en 1580 une grotte dont nous conservons encore la structure, une partie de la décoration, et un dessin préparatoire, pour le jardin du château Da Porto Colleoni à Thiene, près de Vicence. Cet antre à l'esthétique complètement rustique était considéré tellement représentatif du talent de Sorte qu'il a été choisi pour orner le *verso* d'une médaille dédiée à l'artiste. (Fig. 6)

La grotte de l'artiste véronais, et en particulier sa représentation sur le verso de la médaille, a été interprétée comme une référence aux théories exposées dans son traité, selon lesquelles il existe trois types de sources: la première provenant des montagnes alimentée par la fonte des glaces et les précipitations ; la seconde jaillissant à la base des montagnes alimentée par les infiltrations, et la troisième dérivant de la condensation générée à l'intérieur de cavités ou grottes[41]. Si cette hypothèse est juste, la grotte

Fig. 6 . Médaille à l'effigie de Cristoforo Sorte, Brescia, Musei Civici.

de Sorte est étroitement liée à son travail de cartographe qui l'a porté à s'intéresser à l'hydrologie, lui suggérant de mettre en scène dans la grotte le phénomène de condensation présent dans les montagnes, et le rôle de celles-ci comme matrices des eaux. Les points en commun entre ces deux personnages devraient être approfondis et pourraient peut-être révéler d'autres analogies importantes pour notre sujet. Il s'agit en tout cas d'illustrations suggestives de la richesse des enjeux culturels présents dans les grottes artificielles de cette période.

Je voudrais conclure ce parcours dans le jardin de pierres en considérant maintenant les pavillons situés aux extrémités des branches de l'allée cruciforme, qui témoignent eux-aussi du lien étroit entre les intérêts scientifique du potier et ses réalisations artistiques. Palissy les appelle « cabinets verts » car leur structure est cette fois végétale, faite d'ormeaux, sous les branches desquels est située une fontaine en forme de rocher à l'apparence très similaire aux pavillons d'angles. Les pierres y sont mentionnées seulement dans trois des quatre cabinets; dans le premier en effet la description s'attache à la présence d'animaux modelés en céramique, les mêmes que nous trouvons dans la vaisselle typique de la production palisséenne. Dans les autres en revanche, outre l'imitation de la roche par le biais de la céramique, sont présentes d'authentiques espèces minérales, qui témoignent cette fois de la passion de l'artiste le collectionnisme de minéraux. Le second pavillon est orné de cailloux blancs translucides, une typologie qui fait écho à celle dont il parle dans une anecdote de la *Recepte,*

où il narre sa visite à la collection de l'abbé de Turpenay[42]. Il y observa des pierres blanches "semblables à des confettis", qu'il trouva admirables au point de vouloir visiter la grotte de Savonnières d'où elles proviennent. Ces pierres sont formées par des gouttes d'eau riche en carbonate de calcium qui coulent le long de la roche, et une fois à terre durcissent jusqu'à former des cailloux blancs. Le phénomène, aujourd'hui bien connu, a donné leur nom à ces grottes qui sont justement définies « pétrifiantes »[43].

Les deux derniers pavillons verts sont richement ornés de pierres précieuses et de cailloux choisis pour leur forme particulière. C'est à propos du quatrième pavillon vert que Palissy évoque son expérience de collectionneur de pierres. Il faisait en effet partie d'un réseau d'amateurs de sciences naturelles qu'il se complaît à évoquer dans ses écrits comme pour revendiquer le propre statut de philosophe naturel, avec lesquels il échangeait des curiosités trouvées lors de ses promenades. Ses interlocuteurs étaient par exemple Pierre Guoy, maire de Saintes, favorable aux idées réformées qui offrit à Palissy une ammonite[44], ou bien l'avocat Babaud, avec lequel l'artiste discuta à propos d'un oursin pétrifié, objets typiques d'une collection de « merveilles » de l'époque[45]; ou bien encore, le "seigneur de la Mothe", Bertrand de Salignac de La Mothe Fénelon, membre de la cour de Navarre, qui donna au potier un morceau de bois pétrifié[46] ; un "bourgeois de La Rochelle nommé l'Hermite" qui lui donna deux coquilles provenant de Guinée[47], et, enfin l'"abbé de Turpenay", identifié comme Jean Paul de Selve, en charge de 1543 à 1554 et président du Parlement de Rouen[48]. Cette activité était elle aussi source d'inspiration comme en témoigne la description du cabinet:

> Le dernier Cabinet […] sera fort estrange et plaisant : car je feray cercher plusieurs pierres et divers cailloux. Il se trouve souvent és ports et havres de ceste mer Oceane, plusieurs pierres diverses, que les marchans d'etranges pays apportent au fons de leurs navires pour garder qu'il ne soit trop leger (…). Et quand ils sont arrivez, ils jettent lesdites pierres sur le bord de la mer. Il s'en trouve bien souvent, qui sont toutes semees de petites estincelles ressemblantes argent, et de plusieurs diverses couleurs. Au pays de Poitu, s'en trouve de toutes grosseurs, qui sont si tres blanches, qu'estant rompues, elles ont couleur d'un sel blanc, ou de sucre fin : et en ay veu d'aussi grosses que barriques. En ce pays de Xaintonge, és parties limitrofes de la mer, s'en trouve grande quantité, qui en quelque part ou endroit qu'on les puisse rompre, elles sont toutes pleines de coquilles, qui sont formees en la mesme pierre. Ayant donc amassé un grand nombre de toutes ces diverses pierres, je massonneray mon rocher plus estrangement que les susdits. [49]

Un tel passage est une démonstration ultérieure de l'importance de l'expérience de philosophe naturel de Palissy dans le processus créatif, et marque aussi une différence par rapport aux pavillons d'angle. Cette fois il ne s'agit pas de reproduire exclusivement les pierres avec la céramique, mais d'y insérer également d'authentiques exemplaires sélectionnés en fonction de leur étrangeté, rareté ou beauté. En ce sens les pavillons verts s'apparentent à des *wunderkammern*, ces collections de curiosités naturelles et d'objets d'art en vogue dans toute l'Europe au XVI^{e} siècle, qui témoignaient de la culture du

propriétaire, de la *varietas* et de la beauté présente dans la Création[50].

Car c'est bien pour mettre en évidence et célébrer ces merveilles que Palissy décida de projeter un jardin. L'objectif qu'il s'était fixé dans sa description était de mettre en scène non seulement le monde physique grâce à l'art, mais aussi de réaliser un parcours spirituel. Dès les premières lignes de la description, il déclare avoir été inspiré par le psaume cent-quatre, chanté par un chœur de jeunes filles près de la Charente, dont la beauté lui donna l'envie de rendre hommage à Dieu en édifiant un jardin qui illustre le texte biblique. Ce chant célèbre la variété de la Nature, en accordant une large place aux sources d'eau, « qui vont courans, et passent et murmurent entre les monts qui les pleines emmurent », fertilisant la terre, abreuvant les animaux, générant fruits en abondance aux hommes, un rôle fondamental que nous retrouvons au centre de la composition du jardin de la *Recepte*. De ce paysage idéal, cet Eden où règne une parfaite harmonie, sont exclus selon le psaume les « infidèles» et les « pervers »[51], deux mots que Palissy reprend pour qualifier ses ennemis, puisqu'au moment où il écrit, en 1562-63, les protestants, dont il fait partie, sont au cœur des persécutions de la première guerre de religion[52]. Ce jardin est en effet pour l'artiste un refuge utopique pour ses coreligionnaires, un lieu où « recevoir les Chrestiens exilez en temps de persecution, qui seroit une sainte delectation, et onneste occupation de corps et d'esprit »[53].

La valeur morale du jardin est rendue explicite par la présence de phrases tirées des *Livres Sapientiaux* qui ornent chaque pavillon, guidant le visiteur sur le chemin de la foi et conférant à ces œuvres de plaisir une valeur théologique. Ces phrases invitent à la recherche de la Sapience dans le respect et la crainte de Dieu.[54] La Sapience est un attribut théologique aux multiples interprétations exégétiques: cette polysémie est d'ailleurs présente sous la plume de Palissy, qui l'utilise aussi bien comme synonyme de Dieu, que comme sagesse providentielle offerte à tous les habitants de la Terre, que les hommes ont le devoir de chercher et d'utiliser. Dans d'autres passages de la *Recepte* et des *Discours*, Palissy évoque cette sagesse qu'il admire dans les créatures vivantes ; c'est le cas par exemple lorsqu'il décrit les plantes présentes dans les champs qui entourent le jardin, dotées de plus de sagesse que le roi Salomon lui-même : "J'apperceu aussi le froment, et autres bleds, ausquels le souverain avoit donné sapience de vestir leur fruit aussi excellemment, voire plus excellemment que Salomon ne fut oncques si justement vestu avec toute sa sapience"[55]. Ce topos revient aussi dans les *Discours* à propos des pierres, des eaux, des minéraux et de tout autre élément naturel qui éveille son intérêt. Cet hymne à la Nature rendu possible par un art qui représente strictement les beautés naturelles par son esthétique rustique doit être compris comme une invitation adressée à l'homme à s'émerveiller de la perfection de la Création, lui offrant une leçon d'humilité qui transparait en filigrane dans les versets bibliques des pavillons. Pour Palissy l'homme a le devoir d'aider la Nature, de faire fructifier les biens offerts par Dieu mais ne doit pas chercher à la dépasser ou à la transformer comme les alchimistes, cibles de nombreuses de ses attaques.[56] Pour l'artiste comme pour le scientifique rechercher la Sapience signifie avant tout respecter la Création, tenter de

la comprendre à travers l'expérimentation directe qui représente pour Palissy l'unique source fiable de savoir, mais aussi la choisir comme sujet des propres créations.

Cette haute conception de la Nature et de sa représentation correspond parfaitement au credo calviniste qui interdisait la représentation de personnages et scènes sacrés et méprisait les représentations mythologiques[57]. Une telle conception de l'art est présente dans les écrits de Palissy, qui critique ouvertement ses pairs pour le choix des sujets représentés et leur manque d'inventivité – alors que lui-même se revendique « inventeur des rustiques figulines ». Il affirme par exemple dans les *Discours admirables* que: « Les architectes & sculpteurs ne prennent occasion de se glorifier sinon en ce qu'ils sçavent imiter les inventions des payens & veulent estre honorez comme inventeur s»[58]. Le céramiste se place donc à l'opposé de cette tendance qu'il dénonce, en choisissant de dédier tout son art à la représentation et à l'étude de la Nature, faisant fusionner son approche scientifique et artistique dans cette recherche qui consiste non seulement à représenter mais à recréer grâce à la technique du moulage d'après nature, qui permet également d'étudier la matière des créatures.

Pour en revenir au choix de la pierre comme élément principal du jardin, une comparaison avec un autre domaine de l'art me semble enrichissante, celui de la poésie. Je pense en particulier au courant poétique défini par Albert-Marie Schmidt « poésie scientifique »[59] dont l'un des principaux représentant Rémy Belleau (1528-1577), appelé par Pierre de Ronsard « le peintre de la Nature », fut l'auteur en 1576 des *Amours et nouveaux échanges des pierres précieuses*. Dans cette œuvre, le poète raconte les propriétés des pierres, leur histoire, en associant leur symbolisme avec des interprétations philosophiques et scientifiques. – Belleau était aussi collectionneur d'anneaux ornés de pierres précieuses[60] –. Les *Pierres* de Belleau étaient destinées au milieu raffiné de la cour d'Henri III (1551-1589), fréquentée par des nobles, lettrés et scientifiques qui se réunissaient pour discuter de questions philosophiques parmi lesquelles certains problèmes relatifs aux objets naturels comme les minéraux, leurs propriétés et leur origine[61].

L'union entre l'art poétique et la description naturaliste sert à Belleau à démontrer la supériorité de la poésie sur l'analyse scientifique : par les mots il entendait non seulement évoquer mais recréer les pierres, leur donner une nouvelle vitalité capable de dépasser les lapidaires médiévaux[62] d'une part, et les pierres réelles de l'autre, en leur conférant une immortalité impossible dans le monde physique puisque selon lui « Tout ce qu'enfante la nature est sujet à pourriture mêmes les pierres les plus dures»[63]. Mais l'art est aussi pour lui le moyen d'évoquer Dieu : Belleau introduit son recueil en affirmant avoir voulu montrer au lecteur "La simple verité, qui ne se cache point/ Mais bien pour admirer la noble architecture/ De ce gemmeux thresor, miracle de Nature/ Qui a mis et renclos d'effets divins et forts/ Tant de rares vertus dedans ces petits corps". L'observation de ces pierres est donc pour le poète le moyen de connaître et reconnaître Dieu, et dans le contexte des guerres de religion, de retrouver les valeurs chrétiennes indispensables au rétablissement de la paix entre les hommes.

Les démarches de Belleau et Palissy, à la fois démiurgiques et profondément pieuses,

se rejoignent à travers la recréation poétique ou figurative des merveilles naturelles : par la science c'est le monde physique qui est décrypté, par l'art c'est l'ineffable métaphysique qui est exprimé et la sagesse de Dieu transmise grâce à la mise en scène de la beauté et de l'ingéniosité de ses créatures.

Notes

1 Citation tirée de la *Recepte véritable*, in B. Palissy, *Œuvres Complètes*, dir. par M.-M. Fragonard, Paris, Champion, p. 144.
2 Second ouvrage de Palissy, publié chez l'imprimeur rochelais Barthélémy Berton en 1563.
3 La date de naissance de B. Palissy a été longtemps débattue, et 1510 est aujourd'hui retenue comme la plus probable, sur la base du témoignage des chroniques de Pierre de l'Estoile, un proche du céramiste. Cf. P. De L'estoile *Mémoires-journaux*, éd. de G. Brunet, A. Champollion et al., 12 volumes, Paris, Librairie des bibliophiles, 1878, p. 78, e L.N. Amico, *In search of the earthly paradise*, Paris, New-York, 1996, p. 13.
4 Faute de preuves tangibles de son existence, nous disposons d'une description détaillée par Palissy dans l'opuscule intitulé *Architecture et Ordonnance de la grotte rustique*, La Rochelle, chez Barthélémy Berton, 1562. Cf. B. Palissy, *Œuvres complètes* (cit. n. 1).
5 Nous savons par les paiements conservés dans les archives que le céramiste a travaillé aux Tuileries à la « grotte de terre esmaillée» au moins entre 1570 et 1572. Cette activité a été confirmée par la découverte du four pendant les fouilles des dix-neuvième et vingtième siècles. Sur ce sujet je renvoie a l'article alors paru dans la "Revue de l'Art" de B. Dufay, Y. Kisch, P.-J. Trombetta, D. Poulain, Y. Roumégoux, *L'atelier parisien de Bernard Palissy*, in "Revue de l'Art", 78, 1987, pp. 33-60.
6 Cf. E. Kris, *Le style rustique*, introduction de E. Gombrich et postface de P. Falguières, Paris, 2005.
7 Je renvoie sur ce sujet à l'article de Y. Kisch (et al.) *L'atelier parisien…* (cit. n.5), et à l'analyse faite par la thèse de doctorat d'I. Perrin, *Les techniques céramiques de Bernard Palissy*, Atelier de reproduction des thèses, Lille, Thèse sous la direction de J. Guillaume, Université de Paris IV, 1998.
8 Ouvrage cité en n. 1.
9 Cf. L.N. Amico, *In search of the earthly paradise* (cit. n. 3).
10 Nous disposons d'un grand nombre de céramiques en bon état de conservation dont l'attribution est cependant incertaine. Les travaux d'Amico déjà cités ont permis d'attribuer avec certitude certaines pièces, faisant considérablement diminuer le catalogue de l'artiste. Les œuvres les plus certaines sont en réalité les fragments qui ont été retrouvés lors des fouilles et qui proviennent de l'atelier. C'est donc sur des morceaux plus que sur des œuvres intègres que le chercheur peut s'appuyer.
11 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 178.
12 Les grottes se diffusèrent en Italie à partir de Rome, touchent rapidement le reste de l'Europe. Ce sujet a été l'objet de diverses publications depuis les années 1970, et je renvoie aux principales: N. Miller, *Heavenly Caves. Reflections on the Garden Grotto*, New York, 1982; M. Fagiolo, *Natura e artificio. L'ordine rustico, le fontane, gli automi nella cultura del Manierismo europeo*, Rome, 1979 et *La Città effimera e l'universo artificiale del giardino. La Firenze dei Medici e l'Italia del '500*, Rome, 1980, P. Morel, *Les Grottes maniéristes en Italie au XVI^e siècle. Théâtre et alchimie de la nature*, Paris, 1998 ; Hervé Brunon propose une précieuse synthèse des recherches sur ce thème et les grottes françaises en particulier, dans l'article H. Brunon, *Une scintillante pénombre : vingt-cinq ans de recherches sur les grottes artificielles en Europe à la Renaissance*, in "Perspective. La revue de l'INHA: Actualités de la recherche en Histoire de l'art", 2, 2007, pp. 341-376 2005.
13 Ovide évoque l'antre de Diane, « une grotte silencieuse et sombre, qui n'est point l'ouvrage de l'art. Mais la nature, en y formant une voûte de pierres ponces et de roches légères, semble avoir imité ce que l'art a de plus parfait », dans *Les Métamorphoses,* livre III, vv. 158-160.
14 Voir Apulée, *Les métamorphoses*, livre IV, vv. 6-8 :« En arrière de ce groupe s'élève une grotte tapissée de mousse, de gazon, de lianes grimpantes et de pampre, entremêlés çà et là de ces arbustes qui se plaisent sur les rochers. Tout l'intérieur de la grotte est éclairé par le reflet du marbre, dont rien n'égale la blancheur et le poli. Au dehors et sur les flancs pendent des raisins et d'autres fruits, que l'art, émule de la nature, a exprimés avec une vérité parfaite ».
15 Cf. Pline L'Ancien, *Histoire Naturelle*, livre XXXVI, vv. XLII : « Il ne faut pas omettre l'histoire de la pierre ponce. On donne, il est vrai, ce nom aux pierres rongées qu'on suspend dans les édifices appelés musées, pour simuler artificiellement des grottes. »
16 Voir l'exemple magistral de la grotte de Bernardo Buontalenti dans les jardins de Boboli, dont la décoration raffinée a été étudiée par D. Heikamp, *L'interno della grotta grande del giardino di Boboli*, in *Palazzo Pitti, la reggia rivelata*, cat. de l'exposition (Florence 2003-2004), Milan, 2003, pp. 446-475.
17 J'entends par livre de modèles les ouvrage qui circulaient alors dans les domaines de l'architecture ou du dessin, comme par exemple les modèles de

termes proposés par Hugues Sambin dans l'*Œuvre de la diversité des termes dont on use en architecture* (Dijon, 1572), ou encore le *Livre Extraordinaire* de Sebastiano Serlio publié à Lyon par Jean de Tournes en 1551 qui offre un recueil de modèles de portes.

18 Sur l'originalité des grottes palissiennes et leurs enjeux sémantiques je me permets de renvoyer au troisième chapitre de ma thèse de doctorat, J. Ferdinand, *Artigiano delle riforme. Stile rustico e ricerca della sapienza nell'opera di Bernard Palissy (1510-1590)*, dir. par B. Aikema et S. Fommel, Università degli studi di Verona/EPHE Paris.

19 C'est le cas de la Grotte des pins construite en 1543 pour François Ier à Fontainebleau par Francesco Primaticcio dit le Primatice, ou de celle de la Batie d'Urfé (1550 environ) et à la monumentale grotte de Meudon, toujours l'œuvre de Primatice édifiée entre 1556-1559 pour la Cardinal de Lorraine. Cf. F. Bardati, *La "grotte des Pins" a Fontainebleau*, in *Francesco Primaticcio architetto*, dir. par Sabine Frommel, Milan, 2005, pp. 270-274.

20 Sur Pratolino je renvoie en particulier à la thèse d'H. Brunon, *Pratolino: art des jardins et imaginaire de la nature dans l'Italie de la seconde moitié du XVI^e siècle*, soutenue en 2001, sous la direction Université Panthéon-Sorbonne - Paris I, disponible en ligne (http://tel.archives-ouvertes.fr/tel-00349346).

21 J'ai eu la chance de pouvoir observer une partie des fonds du musée d'Ecouen et de Sèvres où sont conservés de nombreux exemplaires de pierres de céramique, dont deux sont reproduits ici. Je remercie les conservateurs M. Thierry Crepin-Leblond conservateur du musée national de la Renaissance et Mme Laurence Tilliard conservatrice da la cité de la céramique.

22 Sous le titre de *Discours du Songe de Poliphile*. Sur cette œuvre la bibliographie est très vaste, et je renvoie ici à quelques ouvrages plus pertinents pour notre essai, l'ouvrage de référence de M. T. Casella et G. Pozzi, *Francesco Colonna, biografia e opere*, Padoue, 1959 ; sur le rôle du Poliphile dans l'art des jardins E. Kretzulesco-Quaranta, *Le Songe de Poliphile et la mystique des jardins de la Renaissance*, Rome-Paris, 1976 (réed 1986) et l'architecture S. Borsi, *Polifilo architetto: cultura architettonica e teoria artistica nell' Hypnerotomachia Poliphili di Francesco Colonna, 1499*, Rome, 1995. Pour l'édition française de 1546 je renvoie à la publication dirigée et présentée par Gilles Polizzi: F. Colonna, *Le Songe de Poliphile*, éd. de G. Polizzi, Paris, 1994.

23 La version française de Jean Martin valorisait en particulier l'aspect architectural comme le démontre la préface au volume, dans laquelle Jean Martin fait la liste des descriptions d'édifices présents dans le livre. La description des fontaines et en particulier l'illusion du mouvement rendue par les jets d'eau. Cf. G. Polizzi, *L'Intégration du modèle: le discours du jardin dans la Recepte véritable de B. Palissy*, in *Bernard Palissy 1510-1590. L'écrivain, le réformé, le céramiste*, in *Albineana 4 numéro spécial*, actes du colloque dir. par F. Lestringant, Ed. interuniversitaires Amis d'Agrippa d'Aubigné, (1^ère ed. 1992), Niort, 2010, pp. 65-92 ; F. Lestringant, *De Francesco Colonna a Bernard Palissy*, in *Cinquecento visionario tra Italia e Francia*, Florence, 1992, pp. 453-467.

24 Pour en citer une seule, je renvoie à la description de la "Vénus Physoè" dans l'édition française de J. Martin. Cf. l'édition de G. Polizzi, *Le Songe de Poliphile* (cit. n. 22), p. 200.

25 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 553.

26 Sur ce thème je renvoie à l'importante étude de Michel Jeanneret: M. Jeanneret, *Perpetuum mobile: métamorphoses des corps et des œuvres de Vinci à Montaigne*, Paris, 1997.

27 Voir les remarques de Didier Kahn, à propos du rapport de Palissy avec l'alchimie et le paracelsisme, sur le sel considéré alors comme l'élément fondamental de la Nature. Cf. D. Kahn, *Alchimie e Paracelsisme en France à la fin de la Renaissance (1567-1625)*, Genève, 2007.

28 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 152.

29 La fascination exercée par les formes créées par la Nature à travers les taches, les veinures ou les nuages est un *topos* qui remonte à l'Antiquité, que l'on trouve dans les écrits de Pline l'Ancien et Lucrèce, diffus dans la peinture italienne de la Renaissance, de Mantegna à Léonard. Le thème a été traité en particulier par H.W. Janson, *"The image made by chance" in Renaissance thought*, in *Essays in Honor of Erwin Panofsky*, New-York, 1961, pp. 256-266; J. Baltrusaitis, *Aberrations : essai sur la légende des formes*, Paris, 1995, pp. 87-149; P. Morel, *Les grotesques: les figures de l'imaginaire dans la peinture italienne de la fin de la Renaissance*, Paris, Flammarion, 1997 ; P. Morel, *Les grottes manièristes* (cit. n. 12) pp. 43-57, et P. Morel, *L' art des grotesques et les marges de la nature: l' hybride et le monstrueux entre science et imaginaire à la fin de la Renaissance*, in *Natura-cultura: l' interpretazione del mondo fisico nei testi e nelle immagini*, actes du colloque dir. par G. Olmi (Mantoue 1996), Florence, 2000, pp. 57-62.

30 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 554. Ces deux phrases sont tirées de la dernière partie des *Discours Admirables* (1580) intitulée « Extrait des sentences principales contenues au present livre » qui résume en partie les théories présentes dans la *Recepte* et les *Discours*.

31 La transmission des théories minéralogiques et leur rapport aux grottes artistiques de la Renaissance ont été l'objet de la belle étude de P. Morel, *Les grottes manièristes* (cit. n. 12).

32 Cf. P. Morel, idem.

33 L'eau qui semble jaillir des rochers pour ensuite retourner nourrir la terre reflète aussi la théorie sur l'origine des eaux que Palissy développera dans les *Discours Admirables*. Palissy combat l'idée alors diffuse selon laquelle les fleuves seraient alimentés par la mer, pour défendre au contraire l'idée que l'eau provient de sources souterraines, émergeant à nouveau au cœur des les montagnes exactement comme dans son jardin.

34 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 143.

35 Palissy narre ses recherches en matière d'art céramique dans un passage célèbre de l'*Art de terre*, un chapitre des *Discours Admirables* publiés en 1580 à Paris.

36 Cf. D. Heikamp, *L'architecture de la métamorphose*, in "L'Œil", 114, juin 1964, pp. 2-9 ; D. Heikamp, *La Grotta Grande del giardino di Boboli*, dans "Antichità viva", 4, 4, 1965, pp. 27-43 ; D. Heikamp, *Les Merveilles de Pratolino*, in "L'Œil", 171, mars 1969, pp. 16-27 et 74-75 ; D. Heikamp, *Pratolino nei suoi giorni splendidi*, in "Antichità viva", 8, 2, 1969, pp. 14-34 ; D. Heikamp, *L'interno della Grotta Grande del Giardino di Boboli*, in "Palazzo Pitti", 2003, pp. 446-475.

37 Ces deux termes désignent deux types d'objets collectionnés durant le XVI[e] siècle : les *naturalia* étaient des spécimens naturels rares, collectionnés pour leur étrangeté, beauté ou vertus particulières ; les *artificialia* étaient au contraire des objets d'art qui avait souvent pour but de rivaliser avec la Nature par le biais d'une imitation virtuose. Je renvoie ici au classique ouvrage A. Lugli, *Naturalia et mirabilia, il collezionismo enciclopedico nelle wunderkammern d'Europa*, Milan, 1990.

38 Sur Sorte je renvoie au récent volume dédié à Cristoforo Sorte : S. Salgaro (dir.), *Cristoforo Sorte e il suo tempo*, Bologne, 2012.

39 Palissy évoque lui-même cette activité dans l'*Art de terre* publié en 1580 dans les *Discours Admirables*, et sur le role joué par Sorte en tant que cartographe je renvoie aux essais de S. Vantini, *Tra corografia e topografia: Cristoforo Sorte, un perito al servizio della Serenissima* et S. Salgaro, *Conoscere i luoghi leggere le senza lettere de 'loro nomi»:Cristoforo Sorte cartografo*, in *Cristoforo Sorte* (cit. n. 38), pp. 287-303 et 305-352.

40 Sur ce traité je renvoie à l'article de M.- D. Legrand, *Les fontaines d'après la Recepte veritable et les Discours Admirables de Bernard Palissy (1510-1590)*, in *Sources et fontaines du Moyen Age à l'Age baroque*, actes du colloque dir. par F. Roudaut (Montpellier 1996), Paris, 1998; et au mien, J. Ferdinand, *Maîtrise et connaissance de l'eau dans l'œuvre de Bernard Palissy*, in *Le Salut par les eaux et par les herbes*, dir. par R. Gorris, Vérone, 2012.

41 C'est l'hypothèse exprimée par Silvino Salgaro dans S. Salgaro, *Ritratti di Cristoforo Sorte*, in *Cristoforo Sorte* (cit. n. 38), p. 250.

42 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 142.

43 Les eaux d'infiltration y sont particulièrement riches en carbonate de calcium; l'eau calcaire coule goutte à goutte, générant des stalactites. Sur le sol se forment des pierres composées de calcite aux formes variées et à l'aspect luisant. Aujourd'hui le phénomène est exploité à des fins artistico-commerciales, se rattachant à distance de cinq siècles à l'esprit maniériste en utilisant la dialectique de la confusion entre l'art fruit de la nature et la nature fruit de l'art.

44 Cf. Palissy, *OEuvres Complètes* (cit. 1), p. 136.

45 Idem, p. 137.

46 Idem, p. 149.

47 Idem, p. 229.

48 Idem, p. 147, n. 248.

49 Idem, pp. 176-177.

50 Ce sujet est à l'origine d'une très vaste bibliographie. Je me permets de renvoyer ici à trois ouvrages fondamentaux : J. von Schlosser, *Raccolte d'arte e di meraviglie del tardo Rinascimento*, (1908), éd. italienne de C. De Benedictis et P. Di Paolo, Florence, 2000 ; A. Lugli, *Naturalia et mirabilia* (cit. n. 37) ; P. Falguières, *Les chambres des merveilles,* Paris, 2003.

51 Les deux mots sont utilisés au tout début de la *Recepte*, p. 108 de l'édition déjà citée.

52 La première des guerres civiles qui déchirèrent la France au XVI[e] siècle fut déclenchée le !er mars 1562 par le massacre des protestants à Wassy ordonné par François de Guise, et se conclue avec l'édit d'Amboise le 19 mars 1563, qui autorise le culte réformé des lieux circonscrits. Cf. *Histoire et dictionnaire des guerres de religion, 1559-1598*, dir. par A. Jouanna, Paris, 1998.

53 Cf. Palissy, *OEuvres Complètes* (cit. n. 1), p. 107.

54 On y lit par exemple: «La crainte de Dieu est le

commencement de Sapience" (*OEuvres Complètes*, p. 165), ou bien «Celuy est malheureux, qui rejette Sapience» (*OEuvres Complètes*, p. 175), ou encore «Par Sapience, l'homme aura l'immmortalité »(*OEuvres Complètes*, p. 176).

55 Idem, p. 190.

56 Sur le rapport de Palissy avec l'alchimie voir l'étude de D. Kahn, *Alchimie e Paracelsisme en France* (cit. n. 27).

57 Je renvoie ici à ma thèse de doctorat qui porte justement sur les enjeux spirituels de l'art de Palissy. Cf. n. 19.

58 Cf. Palissy, *OEuvres Complètes* (cit. n. 1), p. 561.

59 Cf. A.-M. Schmidt, *La poésie scientifique en France au 16. Siècle*, (1938), note liminaire par O. de Magny, Lausanne, 1970.

60 Cf. l'introduction de l'édition des *Amours et nouveaux échanges* de Jean Braybrook : R. Belleau, *Les Amours et Nouveaux Eschanges des pierres précieuses, vertus et propriétés d'icelles*, (Paris, Mamert Patisson, 1576) in *Œuvres poétiques*, dir. par G. Demerson et al., Paris, 1995, p. 90.

61 À ce sujet voir R. J. Sealy, *The Palace Academy of Henry III*, Genève, 1981 ; J. Boucher, *Société et mentalités autour de Henri III*, Paris, 1981, p. 913-942 ; J. Boucher, *Autour de François, duc d'Alençon et d'Anjou, un parti d'opposition à Charles IX et Henri III*, in *Henri III et son temps*, actes du colloque (Tours 1989), Paris, 1992, pp. 121-131.

62 C'est à dire des traités dédiés aux minéraux, qui en présentaient les vertus magiques et médicinales. Sur le sujet je renvoie à l'ouvrage de E. Chayes, *L'éloquence des « Pierres précieuses » de Marbode de Rennes à Alard d'Amsterdam et Remy Belleau : sur quelques lapidaires du XVIe siècle*, Paris, 2010.

63 Cf. R. Belleau, *Les Amours* (cit. n. 60), XII, v. 19.

SUMMARIES, INDEX OF NAMES AND PLACES

Summaries

In the "Hortus universalis": science, technique, and delight in gardens
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Gardens have always been viewed as places of knowledge, in Antiquity as well as in Christian thought. In Early Modern Europe, as craftsmen and other professionals were becoming important protagonists in the evolution of natural sciences, gardens became privileged places for the observation of nature, the cultivation and experimentation of species. In the theory and practice of garden design in the widest sense, scientific investigation could blend in a harmonic way with a variety of esthetic and artistic purposes. The result was an interdisciplinary fusion which renders gardens emblematic luoghi *of the Renaissance mind. The different ways in which manual workers – including gardeners, architects, artists, craftsmen, engineers, etc. – and natural scientists and philosophers, mainly botanists, interacted with each other transforming nature into gardens, is the common thread of the essays present in this volume.*

The garden of nature*: visualizing botanical research in Northern and Southern Europe in the 16th century*[1]
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This article was inspired by the Austrian art historian Otto Pächt's famous essay 'Early Italian nature studies and the early calendar landscape' (1950). Pächt argued that new forms of naturalism in the representation of living nature and landscape emerged – probably not independently – in both Northern Italy and the Burgundian areas in the course of the 14th and 15th centuries. What happened during the 16th century, immediately after Pächt's period, in the specific field of nature study and its visual representation? The focus here is in particular on horticulture and the visual study of plants in a wider cultural, socio-economic, political, and also spatial setting. I argue that in both the Southern Netherlands and Northern Italy the emphasis on highly detailed, descriptive miniare *and an extremely realistic representation of living creatures grew only stronger during the 16th century and manifested itself in media from watercolours and drawings to tapestries, and from decorative arts to oil painting. Both collecting and research in the domain of the life sciences were connected with the shared visual idiom of high-definition naturalism, which indeed became the stylistic norm for the visual representation of naturalia in the professional study of nature all over Europe.*

The Many Gardens – Real, Symbolic, Visual – of Pietro Andrea Mattioli
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Like most of his contemporaries, the Sienese botanist Pietro Andrea Mattioli (1501-1578) attributed a variety of meanings and functions to the notion of garden. During the course of his career, however, the relative importance he ascribed to different 'types' of gardens changed considerably. While he was professionally on the rise, the garden interested him almost exclusively in its vegetable and sensorial form, as a theatre of nature to be directly experienced. During the years of his maturity, nature directly experienced gave way to a primary concern for improving verbal and visual repre-

sentations of plants. As regards Mattioli's frequenting of aristocratic gardens, including those he had personally helped to create, the sources seem to confirm the hypothesis that throughout his entire career these were, on the whole, of secondary importance for him. Mattioli's case suggests that, as early as the fourth decade of the sixteenth century, an awareness had arisen that the cognitive and therapeutic functions of botanic/medicinal gardens were distinct from the purpose of entertainment and self-representation that was peculiar to the aristocratic garden. This awareness engendered separate sets of methodologies, individual behaviors and literary output for each of the two settings without, however, preventing knowledge and experiences from circulating between them.

Hydraulics in Horto: levelling between water and power in seventeenth-century gardens in France and Holland

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This article introduces two Dutchmen who both invented a land-surveying instrument: the mathematician Christian Huygens (1629-1695) and engineer and fountain maker Willem Meester (1653-1701). Christian lived in Paris and was in the service of the French King Louis XIV (1638-1715) and Meester worked as engineer for stadtholder Prince Willem III (1650-1702). The French king and Dutch prince commissioned large fountains with raising water jets for their court gardens, pipes had to bring a constant flow of fresh water from distant sources to the gardens. The course of the pipes had to be carefully calibrated. Between 1679-1680 both men presented their version of an automatic levelling instrument that could calculate the elevation of terrains. Christian Huygen's circle of nobles and scholars made his network much stronger than that of his rival. Meester's invention failed because he was lower in rank and he was seen as a manual worker. Christian used his reputation as a mathematician and philosopher and his extensive network to advocate his own invention and belittled Meester's level. It is argued here that the success and authority of an invention is intricately linked to the strength of the inventor's network and one's social status. The usability of the instrument in the field was of lesser concern.

Facciasi fonti in ciascuna piazza. *Congegni idraulici e fontane di Leonardo per i committenti francesi*

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An enduring connection between Leonardo's most technologically advanced creations and France arises in 1506. In fact, Leonardo projected automatic equipment and hydraulic engineering works in several projects carried out in France, which Leonardo defined as "Instruments and other things which will greatly please our most Christian King" in the foglio 317 r-b [872 r] of the Codex Atlanticus. This suggests that Leonardo might have intended to create for the king of France Louis XII some devices, or even better ingegni*, which might be defined as some technological marvels, the purpose of which was to amaze, astonish with waterworks, tricks, musical instruments, pneumatic and hydraulic systems, robots and clocks. Leonardo designed for Charles d'Amboise some architectural elements for a villa, which was never built. The project appears to have been conceived in view of official receptions and festivities, being a manor with a garden of delights equipped with fountains with waterworks, musical instruments and ingenious hydraulic devices. Leonardo's lesson will then be re-elaborated and adopted thanks to such spectacular effects obtained through hydraulic devices, which were to become a topos of the garden design in the XVI century in Europe.*

Geometry and botany artistically united at Wollaton Hall at the end of the 16th century
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Wollaton Hall in Nottingham, England, is a unique example of an Elizabethan House placed in the landscape like Florentine Villas of the 16th century. Furthermore intellectual models of architecture and science have influenced the design of this place. From the time of the builder Francis Willoughby to the time of his great-grandson Francis Willughby around 1590 to 1670 the place represented the development of gardens in England from an artistic geometrical arrangement of the plantings to a place for the observation of plants and birds in search of ordering principles in nature.

Placere et docere: le jardin minéral de Bernard Palissy
Juliette Ferdinand

*In his project of an ideal garden (*Recepte véritable*, 1563), the French potter Bernard Palissy (1510-1590) describes a personal* modus operandi *that implies an intense dialogue between art and science. This process concerns the imitation of minerals by the medium of* terracotta*, used by Palissy for the construction of artificial rustic grottoes. The essay analyses how, in this case, the creation of counterfeit stones is not only the result of an artistic and aesthetic research, but also an expression of the passion for collecting, and the desire to understand nature. Moreover, such a gradual process, which starts with the research of beauty and produces scientific knowledge aims at a religious purpose, which is to reach spiritual wisdom,* Sapience*, namely a deep faith in the Creator.*

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