Seventeenth-century plant lists and herbarium collections: a case study from Oxford Physic Garden

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Abstract

Lists of pre-Linnaean polynomial names of the plants growing in seventeenth-century European living plant collections are commonplace. However, comparison among lists and interpretation of polynomials in terms of modern Linnaean binomials is a major challenge for researchers.

This paper shows the importance extant pre-Linnaean collections of herbarium specimens for interpreting lists of plant names. More than 4,000 polynomials reported from the Oxford Physic Garden between 1648 and 1676 are linked to over 1,300 Linnaean species names based on an objective methodology.

These fundamental data showed medicinal, culinary and ornamental plants were of interest in the seventeenth-century Garden but that most species were primarily of botanical interest. Nearly 60% of the species were introductions to Britain. Linnaean binomials reveal how the number and sorts of species changed between 1648 and 1676 and how the Garden was used.

Introduction

Collections of natural history objects, amassed by networks of individuals connected by shared interests, correspondence, field excursions and the sale and exchange of specimens have contributed directly to our understanding of the natural world[1]. In sixteenth-century Europe, the range of plants grown in private and institutional gardens expanded as new ideas about the natural world were investigated and continents were explored for plants with economic or social benefits, including medicine, food, wealth and personal influence. At about the same time, cultivation of medicinal plants in physic gardens was established in Italy and spread through continental Europe into Britain. With physic gardens came the development of long-term plant preservation techniques, leading to the creation of 'dried' or 'winter' gardens, today known as herbaria[2]. In seventeenth-century England, herbaria were unusual, expensive curiosities but they rapidly became essential tools for natural philosophers investigating the natural world.

In the 1660s, Edward Morgan (?1619-1689), gardener at the Westminster Physic Garden, created at least one herbarium, and Oxford-trained clergyman John Ward (1629-1681) had a

[1] B. W. Ogilvie, *The Science of Describing. Natural History in Renaissance Europe* (Chicago, 2006), pp.174--82.
[2] A. G. Morton, *History of Botanical Science: an Account of the Development of Botany from Ancient Times to the Present Day* (London, 1981).

'Botanologicall Booke'[3]. On 5th November 1665, Samuel Pepys (1633-1703) described his surprise at the novelty of being shown John Evelyn's (1620-1706) herbarium: 'leaves laid up in a book of several plants kept dry, which preserve colour, however, and look very finely, better than any Herball[4]'. In Oxford, during the 1680s, John Locke (1632-1704) made a herbarium to complement his botanical studies[5].

Naturally, collectors of living or dead plants wished others to know what they possessed. Consequently, lists of the plants in European physic gardens and private collections were published and circulated[6]. Some of these publications, such as Basil Besler's *Hortus Eystettensis* (1613), an account of the plants in the garden of Johann Konrad von Gemmingen, prince bishop of Eichstätt (Bavaria), were expensive luxuries[7]. Others, such as the detailed descriptive and illustrated catalogues of the private gardens of John Gerard (c.1545-1612) and John Parkinson (1567-1650), became standard reference texts for institutional and private plant collections for decades after their publication[8]. However, the limited market and expense of preparing and printing illustrations meant most catalogues lacked either descriptions or illustrations; they were lists of names, for example Simon Warton's *Schola Botanica* (1689), James Sutherland's *Hortus Medicus Edinburgensis* (1683) and Robert Morison's *Hortus Regius Blesensis* (1669).

Early modern physic gardens were envisioned as places where medicinal plants could be displayed together with their correct names. For example, in 1658, on publication of a catalogue to the Oxford Physic Garden, the physician who 'be puffed up with vain perswasion of his own abilities, and shall think because he hath the title of Doctor he may be as idle as he please, and slight the study of Simples[9]' was warned the Garden may teach him something. In the late seventeenth century, Thomas Baskerville (1630-1720) considered the Oxford Physic Garden 'of great use & ornament, prouving serviceable not only to all Physitians, Apothecaryes, and those who are more imediately concerned in the practise of Physick, but to persons of all qualities seruing to help y^{e} diseased and for y^{e} delight &

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[3] D. Power, 'The Oxford Physic Garden', *Annals of Medical History* 2 (1919), pp. 109--25. R. H. Jeffers, 'Edward Morgan and the Westminster Physic Garden', *Proceedings of the Linnean Society of London 164* (1953), pp. 102--33. J. E. Dandy, *The Sloane Herbarium: an Annotated List of the Horti Sicci Composing it: with Biographical Accounts of the Principal Contributors* (London, 1958), pp. 168--70.

[4] S. Pepys, *Diary and Correspondence of Samuel Pepys, F.R.S., the Diary Deciphered by J. Smith, with a Life and Notes by Richard Lord Braybrooke. Vol. 2* (London, 1854), p. 320

[5] S. A. Harris and P. R. Anstey, 'John Locke's seed lists: a case study in botanical exchange', *Studies in History and Philosophy of Science C 40* (2009), pp. 256--64.

[6] See, for example, D. Joncquet, *Hortus, sive, Index Onomasticus Plantarum: quas Excolebat Parisiis Annis 1658. & 1659* (Parisiis, 1659)

[7] A. Arber, *Herbals* (Cambridge,1986), pp.185--246.

[8] J. Gerard, *The herball or Generall Historie of Plantes* (London, 1633). J. Parkinson, *Paradisi in Sole Paradisus Terrestris* (London, 1629). J. Parkinson, *Theatrum Botanicum: The Theater of Plants* (London, 1640). H. Blanche, *British Botanical and Horticultural Literature before 1800 Comprising a History and Bibliography of Botanical and Horticultural Books Printed in England, Scotland, and Ireland from the Earliest Times until 1800. Volume 1. The Sixteenth and Seventeenth Centuries History and Bibliography* (London, 1975).

[9] P. Stephens and W. Browne, *Catalogus Horti Botanici Oxoniensis* (Oxonii, 1658), Preface to the Philobotanick Reader.

pleasure of those of perfect health[10]'. Thomas Sydenham (1624-1689), was less sanguine. He had a poor opinion of universities generally, and Oxford in particular, as places to learn practical medicine: 'one had as good send a man to Oxford to learn shoemaking as practicing physick'[11].

Names are flags conferring identity and enabling information about the natural world to be acquired, ordered, stored and transmitted in time and space. Names may also be used to assert possession or denote an individual's status. In the pre-Linnaean era, formal names for natural history objects were usually phrase names (polynomials). However, independent of whether a name is a polynomial, modern binomial or even vernacular name, for maximum use a name should be: (i) applied unambiguously; and (ii) mean the same thing to all users. The correct application of names therefore has direct scientific, economic and social consequences.

Modern herbaria collections have expanded dramatically over the past three decades but are known to be replete with misidentifications; one headline estimate stating on average 50% of herbarium specimens are incorrectly named[12]. There is no reason to suppose identifications based on herbarium specimens are poorer than those based on living plants or that seventeenth-century naturalists were poorer at identification than their modern counterparts. Consequently, early modern and modern plant lists are likely to suffer from similar problems with specimen identification. Herbarium specimens therefore become essential for interpreting early modern plant lists, and making objective comparisons among such lists. Unfortunately, early modern plant lists complemented by herbarium specimens are very rare.

Plant identification

Correctly naming a plant is a complex process dependent on the quality of the material being named and the comparative material available, together with an individual's experience of, and competency at, naming plants. Furthermore, groups of plants vary in the features that are important for their identification, although generally fruits and flowers are favoured over leaves and other vegetative parts alone. Comparative materials for identification are wide-ranging, taking the form of descriptions, illustrations or preserved specimens. However, in the early modern period, the quality of, and access to, comparative identification material was limited. Furthermore, in the absence of a common descriptive botanical language and a type concept, natural historians needed a detailed understanding of the work of individual authors and were highly dependent on the quality of these authors' descriptions and illustrations, together with membership of networks of natural historians.

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[10] S. H. Vines and G. C. Druce, *An Account of the Morisonian Herbarium in the Possession of the University of Oxford* (Oxford, 1914), p. xiii.

[11] C. Severn, *Diary of the Rev. John Ward, A.M., Vicar of Stratford-upon-Avon, Extending from 1648 to 1679* (London, 1839), p. 242.

[12] Z. A. Goodwin, D. J. Harris, D. Filer, J. R. I. Wood and R. W. Scotland. 'Widespread mistaken identity in tropical plant collections', *Current Biology 25* (2015), pp. 1066--67.

Biological features of plants may compound social aspects of the identification process. For example, seeds exchanged under one name, among individuals growing many closely related species of the same genus in their gardens, may prove to be hybrids and therefore something new. For example, the London Plane (*Platanus* x *hispanica*), a garden hybrid, was described as 'Platanus inter Orientalem et Occidentalem media', an intermediate between the western (*P. occidentalis*) and eastern (*P. orientalis*) planes, by the Keeper of the Oxford Physic Garden in the late seventeenth century[13]. A species' distinctiveness from its close relatives and the subtlety of the characters used for identification present other challenges. For example, the rose (*Rosa*) and dandelion (*Taraxacum*) genera are distinct within the British flora and can be readily identified from even fragmentary botanical specimens or crude drawings. However, trying to separate *Rosa canina* (dog rose) or *Taraxacum officinale* (common dandelion) from their close relatives requires a specialist botanist and carefully-collected specimens made at specific times of the year, or illustrations of exceptional quality[14]. Ultimately, plant identifications are hypotheses refuted by examining specimens (vouchers) named by the person responsible for putting together a species list. Identifications based solely on lists of names, and lacking voucher specimens, rely on the authority of the list compiler.

This paper focuses on the plants in the seventeenth-century Oxford Physic Garden, Britain's oldest surviving scientific collection of living plants, to illustrate the utility of links between living and dried collections. Taking advantage of contemporary species lists and herbarium specimens made by the Garden's first two Keepers, three questions are addressed about the seventeenth-century Garden: (i) What plants were grown? (ii) Did the plants growing in the Garden change over time? (iii) How was the Garden used?

Oxford Physic Garden

The Oxford Physic Garden, formally established in 1621, was secured through a benefaction to the University made by Henry Danvers (1573-1644), although the University had accepted the need for a 'Garden for Physical Simples' more than a year earlier[15]. Wiltshire-born, Oxford-educated Danvers, first Earl of Danby, was a soldier, landowner and courtier to King Charles I. Danvers's notion to create a garden in Oxford may have been inspired by the continental gardens he saw during his exile in the late sixteenth century, a desire to make a lasting mark or perhaps, with the infirmity of his later years, self-interest. Unlike early modern Italian physic gardens, the Oxford Physic Garden was never the centre

[13] MS Sherard 34, f.30v, entry 476 (Sherardian Library of Plant Taxonomy, Bodleian Library). No specimen with this polynomial have been found among the pre-Linnaean collections in Oxford University Herbaria.

[14] R. D. Meikle, *Willows and Poplars of Great Britain and Ireland* (London, 1984). G. G. Graham and A. L. Primavesi, *Roses of Great Britain and Ireland* (London, 1993). A. A. Dudman and A. J. Richards, *Dandelions of Great Britain and Ireland* (London, 1997).

[15] The account of seventeenth-century history of the Oxford Physic Garden is précised from S. A. Harris, *Oxford Botanic Garden & Arboretum. A Brief History* (Oxford, 2017).

of a community of workshops occupied by the tradesmen of physic: herb collectors; processors; and apothecaries[16].

A field, a former cemetery, was rented from Magdalen College, outside the city wall, close to the River Cherwell. The walls and gates, completed by 1633, cost Danvers more than £5,000. The multipurpose garden wall, made of local limestone, marked territory and ownership, defined the Garden's limits and separated Danvers' gift from the rest of Oxford (Fig. 1). The wall's grandiosity emphasised the University's prestige, at the same time protecting the enclosed area from unwelcome incursions. Besides physical protection, the wall had horticultural value as a windbreak and heat trap, helping tender plants grow and choice fruits ripen. In 1670, a 'Plantarum conditorium hyemale', for evergreens such as myrtles and citruses, was built adjacent to the Physic Garden. Eventually, this substantial building was converted to a herbarium, library and accommodation for the professor.

Until the late 1630s, a gardener was thought unnecessary, then the King's gardener, John Tradescant (d. 1638), was approached but he died before the appointment could be finalised. Jacob Bobart the Elder (c.1599-1680; Fig. 2), the Garden's first Keeper, took up his position in 1642. We know little of Bobart, the 'Germane Prince of Plants', other than he was a tall, strong, Brunswick-born, former soldier and an eccentric publican with a penchant for topiary. Bobart married twice, had at least ten children, of which his son Jacob (1641-1719; Fig. 3) became his successor as Garden Keeper. Bobart was a wealthy, literate man who, when he died, owned and leased property across Oxford, made substantial bequests to his daughters and divided his library between his sons. Despite running the Garden neither Jacob nor his son was ever a member of the University.

Danvers offered Bobart the Elder a lease, subject to his good behaviour and appropriate care for the Garden; his annual salary was £40 and the income from the Garden's produce[17]. With 'great Skill and indefatigable industry' Bobart established the Garden, apparently to the surprise of some commentators: 'how expert a Gardener he hath showed himself[18]'. Bobart made a healthy living from his commercial interests in the city and from the Garden for decades. The Bobarts, father and son, also built a personal botanical library and herbarium to complement the living collections. Between 1669 and 1683, Jacob Bobart the Elder's horticultural activities were complemented by the appointment of a Regius Professor of Botany, the Royalist Civil-War veteran, and physician to Charles II, Robert Morison (1620-1683). Morison apparently had a great influence on the physical appearance of the Garden: 'Hee [Morison] shewed ym [Bobart the Elder] all his designs in ye new Garden; There are to bee walks in itt of thirtie foot wide[19]'.

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[16] P. Findlen, *Possessing Nature. Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley, 1994), pp. 256--61.

[17] See Vines and Druce, op. cit. (note 10), pp. xvi--xvii.

[18] See Stephens and Browne, op. cit. (note 9), Preface to the Philobotanick Reader.

[19] See Power, op. cit. (note 3), p. 119.

Morison taught in the Garden, and continued the research for his *Plantarum Historiae Universalis Oxoniensis*, a new classification of the world's plants[20]. Unlike many large seventeenth-century gardens, the Oxford Physic Garden could not rely on finance from either wealthy individuals or parent organisations; Danby's substantial bequest had been spent building the Garden's fabric. Until 1734, and a settlement from the will of English diplomat William Sherard (1659-1728), the University provided no regular funding for the Garden's upkeep.

Oxford-born Bobart the Younger remained at the Garden his whole career. First, he worked for his father, then as Keeper in his own right. Bobart maintained his father's practice of selling plants and acting as a rare-plants nurseryman for wealthy gardeners[21]. The younger Bobart was widely travelled and highly respected by scholars and gardeners in Britain and Europe. In 1659, the 18-year-old Jacob Bobart the Younger was sufficiently well regarded to add his signature to a petition urging publication of John Evelyn's *Elysium Britannicum*[22]. When Morison was killed in 1683, Bobart took on his teaching and academic duties but not the professorial title. During the 1680s, Bobart fostered a life-long friendship with William Sherard. Bobart was crucial in developing Sherard's botanical interests and enthusiasm for herbaria; Sherard eventually amassed 'the most ample, authentic, and valuable botanical record in the world[23]', the Sherardian Herbarium, which he bequeathed to the University. Both Bobarts are buried in the churchyard of St. Peter's-in-the-East, Oxford, which is now part of St. Edmund Hall College.

Little information has survived about the activities of gardeners in the mid-seventeenth-century Oxford Physic Garden. Consequently, observations by witnesses, such as John Ward, are particularly valuable. Ward became vicar of Stratford-on-Avon but was based in Oxford between 1646 and c. 1660. Between 1648 and 1679, he sporadically made observations in common-place books relating to medicine and to plants. Most of Ward's botanical knowledge appears to have come from three people: Jacob Bobart the Elder, Robert Morison and Edward Morgan[24].

Bobarts' catalogues and herbaria

Three plant lists were made for the Oxford Physic Garden during the seventeenth century. In 1648, an anonymous catalogue of the Garden, *Catologus Plantarum Horti Medici Oxoniensis*, was published; traditionally, the author is identified as Jacob Bobart the Elder[25]. The *Catologus*'s two, unannotated, alphabetical lists of names, Latin-English and English-

[20] S. Mandelbrote, 'The publication and illustration of Robert Morison's *Plantarum historiae universalis Oxoniensis*', *Huntington Library Quarterly 78* (2015), pp. 349--79.

[21] Various seed lists in Bobart the Younger's hand (British Library; Sloane MS 3343 f.35-36, 45-46, 48, 57, 135-137, 141, 236).

[22] J. Evelyn, *Elysium Britannicum, or the Royal Gardens*. Edited by J. E. Ingram (Philadelphia, 2001), pp. 461--62. The other signatories were Jacob Bobart the Elder, Philip Stephens, William Browne, Robert Sharrock, John Paris, Josiah Lane, Richard Inglett, Simon Welham, John Bannister, William Austin and Arthur Smith.

[23] J. E. Smith, 'Sherard, William', in A. Rees (ed.), *The New Cyclopaedia, vol. 32, part 2* (London, 1816).

[24] See Power, op. cit. (note 3).

[25] Anonymous, *Catalogus Plantarum Horti Medici Oxoniensis* (Oxonii, 1648).

Latin, comprise 1,368 names. In 1658, the Oxford-based academics Philip Stephens (c.1619-1679) and William Browne (1628-1678) wrote a second edition of the *Catologus*, *Catalogus Horti Botanici Oxoniensis*[26], singling out the teenaged Bobart the Younger for particular acknowledgement on the title page. In this volume, a detailed alphabetical list of 1,889 Latin names included English names and partial references to classical botanical works, although the main references are to the English works of John Gerard and John Parkinson 'out of the respect we have for our own country[27]'. There is also an incomplete alphabetical list of English-Latin names. A manuscript list of plants growing in the Botanic Garden, divided into two parts, *Catalogus Herbarum ex horto Botanico Oxoniensi* and *Altera pars Catologi ex Horto Botan: Oxon:* (dated 1676) in Jacob Bobart the Younger's hand appears to be a draft for another edition of the *Catologus*[28]. In the manuscript, 1,112 polynomials, together with English names, are numbered; in the first part they are arranged by flowering month.

Identification based on pre- Linnaean polynomials is difficult and has been characterised as 'interpretation rather than an equation'[29]. The authors of the 1658 Catalogue introduced additional confusion 'when any plants are called by obscure or unfit names … the liberty [is taken] to impose [a] name of our own[30]'. Objective interpretation and comparison of the polynomials in the Garden lists was only possible because of three, mid- to late-seventeenth-century herbarium collections directly associated with the Bobarts (Fig. 4): Bobart the Younger's *Hortus Siccus*; Bobart the Elder's Herbarium; and the Morisonian Herbarium[31]. Bobart the Younger's *Hortus Siccus* was evidently well-known in Oxford. In his hagiographic poem *Vertumnus* (1713), Abel Evans (1675-1737) made mention of the herbarium: 'Thy *Hortus Siccus* still receives: [/] In Tomes twice Ten, that Work immense! [/] By Thee compil'd at vast Expence; [/] With utmost Diligence amass'd, [/] And shall as many

[26] See Stephens and Browne, op. cit. (note 9).

[27] See Stephens and Browne, op. cit. (note 9), p. 190 (unnumbered). See Gerard, op. cit. Parkinson, Paradisi, op. cit., Parkinson, *Theatrum*, op. cit., (note 9).

[28] J. Bobart, *Catalogus Herbarum ex Horto Botanico Oxoniensi* and *Altera Pars Catologi ex Horto Botan: Oxon:* Unpublished MS (1676) (MS Sherard 32; Sherardian Library of Plant Taxonomy, Bodleian Library, Oxford).

[29] J. Harvey, *Early gardening catalogues: with complete reprints of lists and accounts of the 16th-19th centuries* (London, 1972). J. H. Harvey, 'The English nursery flora, I677-1723', *Garden History 26* (1998), p. 66. B. Halliwell, *Three Centuries of Garden Lists* (Halifax, 2009), pp. 80-103 provides a partial interpretation of the polynomials in Anonymous, op. cit. (note 25).

[30] See Stephens and Browne, op. cit. (note 9), 'Preface to the Philobotanick Reader'.

[31] Bobart the Younger's *Hortus Siccus* comprises 2,202 specimens mounted on individual sheets and filed according to Morison's *Sciagraphia*. The contents of this collection have been briefly described by S. A. Harris, 'Bobart the Younger's *Hortus Siccus*', *Oxford Plant Systematics 13* (2006), pp. 10-11. The date of this collection is unknown. Vines and Druce, op. cit. (note 10), based on circumstantial evidence, suggest the collection may have been made around 1666. Bobart the Elder's herbarium is a single, leather-bound, elephant-folio, book herbarium of c. 2,800 specimens, arranged alphabetically by polynomial name. This collection was reacquired by the University in the early 1950s, see S. Savage, 'A book Herbarium made by Jacob Bobart 1660', *Proceedings of the Linnean Society of London* 160 (1948), p. 55. On the pastedown of the inside back cover is a note stating 'Octob: 6: 1687 the number of Plants in this was 2577'. Despite its name, the Morisonian Herbarium was put together by Jacob Bobart the Younger to support Part III of Morison's *Plantarum Historiae Universalis Oxoniensis* and is arranged according to Morison's *Sciagraphia*. The collection comprises some 6,500 specimens mounted on individual sheets and has been documented by Vines and Druce, op. cit. (note 10).

Ages last[32]'. Jacob Bobart the Younger also contributed large numbers of specimens, and annotations, to the Sherardian Herbarium, from which specimens were abstracted in the late nineteenth century by George Claridge Druce (1850-1932) to create the Dillenian Herbaria[33]. Both Sherard and Bobart the Younger also exchanged specimens with Charles Dubois (c.1658-1740), cashier-general of the East Indian Company[34]. Together these pre-Linnaean collections comprise approximately 49,000 specimens and are preserved in Oxford University Herbaria (Department of Plant Sciences).

Modern Linnaean names were associated with the 4,369 polynomials in the three Garden lists, by putting each polynomial through a 'polynomial pipeline' (Fig. 5; Supplementary Data[35]). The pipeline emphasises herbaria directly associated with the Bobarts (*Hortus Siccus*, Bobart the Elder and Morisonian Herbaria) or potentially contributed to by them (Sherardian, Dillenian and Dubois Herbaria); particular attention was paid to specimens labelled by either of the Bobarts, usually the Younger. Published classification systems (those of Robert Morison and John Ray, 1627-1705), directly or indirectly associated with the Bobarts, and the unpublished manuscript of William Sherard's *Pinax*, were used to establish likely polynomial synonyms[36]. Standard illustrated works on British garden plants, published by John Gerard and John Parkinson, present in the Bobarts' personal library, were consulted[37]. As identifications became more remote from the Bobarts, or relied on descriptions or illustrations in the early modern literature, confidence in the association of a modern botanical identification with a Bobartian polynomial declined. Identification confidence was also determined by the variable quality of the herbarium specimens and the taxonomic difficulties associated with particular plant genera, e.g., *Rosa* (roses)*, Rubus* (brambles), *Salix* (willows) and *Taraxacum* (dandelions). Consequently, a three-point identification-confidence scale (high, moderate, low) was applied to polynomial-Linnaean binomial association based on material quality and taxonomic difficulty (Supplementary Data Table 1). Plants were identified as medicinal if they appeared in the 1618

[32] A. Evans, *Vertumnus. An Epistle to Mr. Jacob Bobart, Botany Professor to the University of Oxford, and Keeper of the Physick Garden* (Oxford, 1713), p. 29.

[33] G. C. Druce and S. H. Vines, *The Dillenian Herbaria. An Account of the Dillenian Collections in the Herbarium of the University of Oxford* (Oxford, 1907).

[34] H. N. Clokie, *An Account of the Herbaria of the Department of Botany in the University of Oxford* (Oxford, 1964).

[35] Complete catalogue linking polynomials and modern binomials, together with all herbarium specimens used to determine the links, is provided as Supplementary Data.

[36] Morison's *Plantarum Historiae*, extensively illustrated with black and white copper engravings, was to have been published in three volumes. Volumes two and three were published by Morison in 1680 and Bobart the Younger in 1699, respectively. Volume one was never published, although a manuscript of its contents, in Jacob Bobart the Younger's hand, is preserved (MS Sherard 34, Sherardian Library of Plant Taxonomy, Bodleian Library). Sherard's *Pinax* (MS Sherard 44-173, Sherardian Library of Plant Taxonomy, Bodleian Library) is a listing of polynomial synonyms started by William Sherard at the end of the seventeenth century and annotated by subsequent Sherardian Professors until the end of the eighteenth century, see S. A. Harris, 'William Sherard: his herbarium and his *Pinax*', *Oxford Plant Systematics* 21 (2015), pp. 13--15.

[37] The personal library of Jacob Bobart the Younger is incorporated into the Sherardian Library of Plant Taxonomy, Bodleian Library.

Pharmacopoeia Londinensis, Culper's *A physicall directory* (1649) or Sutherland's *Hortus Medicus Edinburgensis* (1683)[38].

The authors of the three Garden lists made use of collective polynomials, e.g., 'Pyri quam plurimae aliae species', 'Blita diversorum specierum' and 'Prunus albo diversi specii', or in the case of tulips and carnations the names were explicitly omitted since they were numerous and particular[39]. When lists were compared, names in these classes were omitted hence the total number of sorts of plants grown in the seventeenth-century Garden are underestimated[40].

What plants were grown in the seventeenth-century Garden?

Numbers of sorts are frequently used as a convenient means of comparing collections, and implying either importance or comprehensiveness. Thomas Baskerville in his late-seventeenth-century account of the Garden emphasises the number of plants and their purpose: 'containing therein 3000 seuerall sorts of plants for y^{e} honor of our nation and Universitie and service of y^{e} Com[m]onwealth[41]'.

In total, 2,435 polynomial names, representing at least 1,311 Linnaean taxa[42], were reported from Oxford Physic Garden between 1648 and 1676 (Fig. 6). Seven years after its establishment, James Sutherland reported 1,876 polynomials from the *Hortus Medicus Edinburgensis*, an area of just over one acre (0.53 ha)[43]. In contrast, 1,336 polynomials (894 taxa) were reported from the five-acre (2.02 ha) Oxford Physic Garden, six years after Bobart the Elder was appointed.

Danby's intention was the Garden should grow and display medicinal plants for teaching purposes. In practise, between 1648 and 1676, at least 346 medicinal species (c. 26% of all species), such as *Aconitum anthora* (yellow monkshood) and *Nepeta cataria* (catmint), were grown in the Garden (Fig. 6b). For comparison, approximately 20% of all species grown in the *Hortus Medicus Edinburgensis* in 1683 were medicinal plants[44]. Bobart the Elder evidently used plants in preparations he administered to himself and his animals; 'he used in his quartane[,] Lap[athum]. Contraervae and a little posset-drink; hee took itt a little before

[38] In the absence of detailed descriptions or illustrations in these texts, broad definitions of the medicinal plants being referenced have been used. J. Sutherland, *Hortus Medicus Edinburgensis, or, a Catalogue of the Plants in the Physical Garden at Edinburgh* (Edinburgh, 1683). F. W. Robertson, 'James Sutherland's 'Hortus Medicus Edinburgensis' (1683)', *Garden History 29* (2001): 121--51.

[39] See Anonymous, op. cit.(note 25). See Stephens and Browne, op. cit. (note 9), Preface to the Philobotanick Reader.

[40] Following omission of collective polynomials there were 1,336, 1,800 and 1,090 polynomials in the 1648, 1658 and 1676 lists, respectively, giving a total of 4,226 unique polynomials. Inspection of the three herbaria revealed hundreds of specimens, probably from the Garden, of taxa not reported in the garden lists.

[41] See Vines, op. cit. (note 10), p. xiii.

[42] 'Species' or 'taxa' in the Garden refer to Linnaean species or taxa. Taxonomic entities recognised by the Bobarts are referred by their polynomials or as 'sorts'.

[43] See Robertson, op. cit. (note 37). It is unclear to how many Linnaean binomials are represented by these polynomials.

[44] See Robertson, op. cit. (note 37).

ye fit and sweat mightily[45]' and an 'adder stung a dog of Bobarts … Jacob gave him white horehound and aristolochia in butter, and cured him presently[46]'. *Taxus baccata* (yew), now regarded as a medicinal plant, was used by Bobart as an ornamental[47].

Favourite ornamentals of the period, such as *Anemone hortensis* (broad-leaved anemone; at least 36 types) and *Narcissus* (daffodil; at least 32 types), food plants, such as *Brassica oleracea* (cabbage; at least nine types) and *Lactuca sativa* (lettuce; at least five types), were elements of the Garden's stock[48]. Such plants were necessary not only to provide the Garden with an income but to support the Bobarts' personal horticultural interests. Bobart was evidently proud of the range of ornamentals and culinary plants he grew[49]. On 23rd March 1661, Ward reports 'five sorts of fritillaries' flowering in the Garden. Furthermore, 'there are 8 kinds of sorrel … This Jacob told mee.' Bobart the Elder was a well-known auricula breeder[50]. The vast majority of the 67 polynomials (at least 30 Linnaean species) identified as unique to the Oxford Garden in 1658 are minor morphological or colour variants of widely cultivated species.

Vines and fruit trees, such as *Vitis* (grapes), *Punica* (pomegranates) and *Ficus* (figs) were probably trained against the walls[51]. John Ward reports Bobart the Elder 'had a bunch of grapes once ripe on ye 5th. August wch. hee presented to ye Swedish Embassador' and had 'seen the double pomegranate as high as their garden wall with 500 Balaustines or flowers uppon itt'[52]. Ward also saw 'English figs … ripe at ye Physic Garden September 21 1661 some were presented to ye Chancellor'. Earlier in 1661, 'almonds in ye physic garden [came] to some kind of ripeness[53]'. Bobart the Elder, a skilled grafter of trees and vines, is credited with inventing a grafting method, and managed to make the popular 'White Frontiniac' vine fruit early by grafting it onto the 'Parsly' vine[54].

However, the Bobarts' concentration on horticultural productivity appears to have affected the Garden; in 1664, during his English tour, the French physician Samuel de Sorbière (1615-1670) dismissed the Garden as 'small, ill kept, and more like an Orchard than

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[45] See Power, op. cit. (note 3), p. 121. This name is not recorded in the Garden catalogues and does not appear on specimens in the *Hortus Siccus*, the Morisonian herbarium or Bobart the Elder's herbarium.

[46] See Severn, op. cit. (note 11), p. 277.

[47] J. Goodman and V. Walsh, *The Story of Taxol: Nature and Politics in the Pursuit of an Anti-Cancer Drug* (Cambridge, 2006). A yew tree planted by Jacob Bobart the Elder, c. 1645, formed part of the original north-south hedge that split the Garden. Today it is the oldest tree in the Garden, see Harris, op. cit. (note 15).

[48] R. Duthie, *Florists' flowers and Societies* (Princes Risborough, 1988).

[49] See Power, op. cit. (note 3), p. 117--18.

[50] J. Rea, *Flora, seu, de Florum Cultura, or, a Complete florilege: Furnished with all the Requisites Belonging to a Florists. In III Books* (London, 1665). Named auricula cultivars are found in Bobart the Elder's Herbarium (BSn-A33r, Oxford University Herbaria).

[51] Some of the top fruit in the Garden was evidently considered unusual: 'A Boon-Crysson, Mounseer John and Mon Dieu, all French pears. … Dr. Modesey [Morison] hath itt'. See Power, op. cit. (note 3), p. 122.

[52] See Power, op. cit. (note 3), p. 119.

[53] See Power, op. cit. (note 3), p. 118.

[54] R. Sharrock, *The History of the Propagation & Improvement of Vegetables by the Concurrence of Art and Nature* (Oxford, 1672), p. 116. R. Plot, *The Natural History of Oxford-shire, Being an Essay toward the Natural History of England* (Oxford, 1677), p. 260.

a Garden'[55]. Five years later, Cosimo III de' Medici (1642-1723), Grand Duke of Tuscany thought the Garden 'scarcely deserves to be seen' from the 'smallness of its site, irregularity, and bad cultivation'[56].

Most plants growing in the Garden could not be conveniently grouped as medicinal, ornamental or culinary since they were probably grown for their curiosity value to the Bobarts and Morison. Among the more curious seventeenth-century plants were sensitive and variegated plants[57].

Seventeenth-century definitions of plants had changed little since Theophrastus; animals had active responses to external stimuli, whilst plants were passive. Yet sensitive plants responded to external stimuli, such as heat, touch and chemicals, by moving their leaves[58]. This heterogeneous group of plants was well known in English plant collections before Evelyn visited Oxford Physic Garden in 1654. Carolus l'Ecluse (1526-1609) first described 'Herba mimosa' from a dried specimen collected by John Layfield (d. 1617) in Puerto Rico in 1598, and Thomas Johnson (d. 1644) saw a dried herbarium specimen in 1632 as he revised Gerard's *Herball* (1597). John Tradescant the Elder had material after 1634, whilst John Parkinson saw a plant in John Danvers' (c. 1585-1655) Chelsea garden that had been grown from seed in 1638. 'Herba sensibilis' and 'Herba humilis' were recorded from the Physic Garden in 1648 and 1658. 'Herba sensibilis' is an unidentified mimosoid legume, whilst 'Herba humilis' is *Mimosa pudica*[59]. By 1676, no sensitive plants were recorded from the Physic Garden, although Robert Morison described and illustrated six sorts in 1680[60].

Variegated plants were of considerable interest to Morison and the Bobarts. Morison appears to have brought a variegated form of *Solanum dulcamara* (woody nightshade) to Oxford from Blois, and the collection of variegated plants, including forms of *Ilex aquifolium*

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[55] S. Sorbière, *A Voyage to England: Containing Many Things Relating to the State of Learning, Religion, and other Curiosities of that Kingdom. As also, Observations on the Same Voyage, by Dr. Thomas Sprat, Lord Bishop of Rochester. With a Letter of Monsieur Sorbière's, Concerning the War between England and Holland in 1652: to All Which is Prefix'd his LIfe Writ by M. Graverol* (London, 1709), p. 42.

[56] L. Magalotti, *Travels of Cosmo the Third, Grand Duke of Tuscany, Through England, During the Reign of King Charles the Second (1669)* (London, 1821), p. 262.

[57] C. Webster, 'The recognition of plant sensitivity by English botanists in the seventeenth century', *Isis* 57 (1966), pp. 5--23. J. Woudstra, ''Striped plants': the first collections of variegated plants in late seventeenth-century gardens, *Garden History* 34 (2006), pp. 64--79.

[58] See Webster, op. cit. (note 57).

[59] 'Herba mimosa sive sensibilis' (BSn-H05r-05) is a sterile specimen, associated with a separate mature fruit glued on a piece of paper and then mounted on the sheet. The stipule and bract characters associated with the leaves and fruit of this specimens do not match, indicating that the collection is mixed. 'Herba humilis' (BSn-H05r-07) is a seedling and a separate mature leaf. Bobart the Younger associated the latter with 'Mimosa seu pudica ramulis & foliis sensilibus' growing in the Jardin du Roi, Paris, see S. Warton, *Schola botanica sive catalogus plantarum, quas ab aliquot annis in Horto Regio Parisiensi Studiosis indigitavit* (Amstelaedami, 1689), p. 300. From Specimen BSn-H05r-05, Bobart the Younger is doubtful whether 'Herba mimosa sive sensibilis' is equivalent to Parkinson's illustration of 'Mimosa seu Frutex sensilis'.

[60] R. Morison, *Plantarum historiae universalis Oxoniensis. Pars secunda* (Oxonii, 1680), pp. 198--201, Sect. 2, Tab. 23). Five of the six illustrations were copied from three works, see C. Acosta, *Trattato di Christoforo Acosta Africano Medico, & Chirurgo della Historia, Natura, et Virtu delle Droghe Medicinali, & Altri Semplici Rarissimi, che Vengono Portati Dalle Indie Orientali in Europa* (Venetia, 1585), p. 181, W. Piso and G. Marcgravi, *Historia Naturalis Brasiliae* (Batavorum, Amstelodami, 1648), p. 73, G. Zanoni, *Istoria Botanica* (Bologna, 1675), t.119, t.121. t.123).

(holly), *Artemisia vulgaris* (mugwort) and *Cruciata laevipes* (crosswort), gradually increased during the seventeenth century. Most of these forms were probably collected from the wild. For example, Jacob Bobart the Younger collected striped *Acer pseudoplatanus* (sycamore) from the grounds of Madgalen College, and was part of the Garden collection by 1676[61].

The majority of Linnaean species grown in the seventeenth-century Garden were primarily Eurasian introductions (785 species; 59.9%; Fig. 6c). These introductions included species such *Calendula officinalis* (garden marigold), which had been part of British gardens for centuries. Others, such as North American *Oenothera biennis* (evening primrose), were more recent introductions to Britain. Among the 526 British native species grown in the Garden, 436 (82.9%) were native to Oxfordshire, which is more than half of the native flowering plants recognised in Oxfordshire today[62]. As might be expected, given the Garden's location, many marshland and aquatic plants were reported from the Garden, including *Butomus umbellatus* (flowering rush), *Groenlandia densa* (opposite-leaved pondweed) and *Hottonia palustris* (water violet). Surprisingly the native plants reported as growing in the Garden included parasites such as *Lathraea squamaria* (toothwort) and *Orobanche rapum-genistae* (greater broomrape); these species are more likely to have been adventives rather than specifically cultivated. Similarly, fungi, lichen, mosses and liverworts reported from the Garden are unlikely to have been actively cultivated.

Combining lists of polynomial names and contemporary herbarium specimens means the species growing in the Oxford Physic Garden in the mid seventeenth century have been rigorously identified. However, 498 polynomials (20.5%) of the polynomials remain unidentified to species rank because specimens were never collected, have been lost or decayed, or lack essential parts necessary for reliable identification. In some cases, the failure is because a polynomial cannot be linked with a single Linnaean species. For example, Bobart the Younger uses the name 'Rhus Virginiana' to label herbarium specimens of *Rhus typhina* and *Rhus copallinum*[63].

By 1675, the Oxford Physic Garden was divided into gated quarters, presumably hedged with yew, with a conservatory outside the North Wall (Fig. 1). Despite detailed knowledge of the Garden's overall appearance and of the species growing in it, one can only speculate upon how plants were arranged in the Garden's beds. John Evelyn suggested two methods to arrange academic gardens; 'confusedly, & according to their severall aspects & soile[64]' or alphabetically. Evelyn recommended the 'confused' approach, combined with labelling plants used numbered, lead tallies matching numbers in an '*Album memoriae* which should

[61] See Plot, op. cit. (note 53), p. 172. See Bobart, op. cit. (note 28). Bobart the Elder herbarium (Specimen BSn-A03r-09; Oxford University Herbaria).
[62] J. Killick, R. Perry and S. Woodell, *The Flora of Oxfordshire* (Newbury, 1998), p. 71.
[63] Specimen BSn-R05r-10 is *Rhus typhina* L., whilst specimen Mor_Arb_0553 is *Rhus copallinum* L. (Oxford University Herbaria).
[64] See Evelyn, op. cit. (note 22), p. 406.

be a Booke purposely designed for Garden, where~~in~~ they may be entered in Alphabeticall Catalogues, referring to their severall situations, beds, & places[65]'.

However, alternative arrangements were available. In the *Hortus Medicus Edinburgensis*, Sutherland arranged plants into six plots[66]. Two plots were arranged according to Gaspard Bauhin's *Pinax* (1623), a third plot contained garden ornamentals and a fourth comprised alphabetically arranged medicinal plants. A fifth plot included a pond and a small nursery, whilst the final plot was devoted to woody plants. Four quarters in the Oxford Physic Garden is reminiscent of a world divided into four continents as in the frontispiece to Parkinson *Theatrum Botanicum* (1640)[67]. Given the close association of the Garden with Morison's classification system from 1669, it is tempting to assume this system was adopted in the Garden. Unfortunately, Morison's classification was never completed and the first published part only appeared in 1680. If any classification-based arrangement were adopted it is more likely to have been that of Bauhin, as adopted in Edinburgh.

How did the plants grown change during the century?

As might be expected for a fledgling garden in an academic institution, there was change in Garden's contents between 1648 and 1676. The living collection increased through the acquisition of species not previously grown or new forms of species already growing. The collection decreased when species died because of pest and diseases or the discovery that conditions were inappropriate for them to flourish. Approximately six years after Jacob Bobart the Elder took up his post, at least 894 species (1,336 polynomials; Fig. 6) were growing in the Garden. A decade late, there were at least 1,111 species (1,801 polynomials). Nearly twenty years after that, Bobart the Young recorded at least 797 species (1,090 polynomials) in the Garden. Throughout this period 513 species (39.2% of all species; 535 polynomials) were grown continuously, which included 208 medicinal plants (60.1% of all medicinal species), e.g., *Bellis perennis* (daisy), *Santolina chamaecyparissus* (cotton lavender) and *Punica granatum* (pomegranate).

At least 37 species (2.8% of all species; 277 polynomials) were unique to the 1648 list, including seven medicinal plants, e.g., *Asplenium adiantum-nigrum* (black spleenwort), *Cymbopogon schoenanthus* (camel's hay), *Prunus spinosa* (blackthorn). At least 152 species (11.6% of all species; 566 polynomials) and 146 species (11.1% of all species; 336 polynomials) were reported only from the 1658 and 1676 lists, respectively. Unique records are species the Bobarts failed to maintain between census dates or were overlooked/ ignored by different recorders (e.g., the moss *Thuidium tamariscinum*), although in the case of the 1676 list we do not know how many of these species went on to survive in the Garden. Surprisingly, *Viscum album* (mistletoe) was reported in 1648 but not later lists, whilst among the more unusual, and less surprising, 1658-list species which did not survive

[65] See Evelyn, op. cit. (note 22), pp. 398, 406. Early-eighteenth-century numbered, lead labels have been found in the Oxford Physic Garden but there is no evidence of an accompanying '*Album memoriae*', See Harris, op. cit. (note 15).

[66] R. Sibbald, *Scotia Illustrata sive Prodromus Historiae Naturalis* (Edinburgh, 1684), pp. 65--66.

[67] J. Prest, *The Garden of Eden. The Botanic Garden and the Re-creation of Paradise* (New Haven, 1981)

were the African/Indian *Tamarindus indica* (tamarind) and the North American *Toxicodendron radicans* (poison ivy).

The Bobarts evidently retried cultivating 17 species (1.3% of all species; 22 polynomials) from the 1648 list by 1676, which were absent from the 1658 list. Among these species were four medicinal plants, *Paeonia mascula* (male peony), *Paeonia officinalis* (common peony), *Primula vulgaris* (primrose) and *Salvia sclarea* (clary sage). Six species are surprising inclusions in this list of species. *Aegopodium podagraria* (ground elder) is probably a Roman introduction to Britain and a widespread and persistent weed. Four species, *Geranium columbinum* (long-stalked crane's bill), *Primula vulgaris*, *Stellaria holostea* (greater stichwort), *Veronica arvensis* (wall speedwell), are Oxfordshire natives and likely to have been widespread in the Bobarts' time, whilst *Triticum aestivum* (bread wheat) was a common seventeenth-century crop.

When Morison took up his post in Oxford (1669), he was ambitious to expand the Garden's living collection but limited by resources: '[Edward] Morgan told mee [Ward] of a person [Morison] yt hee knew yt would undertake to raise 500 plants more yn ever was in England in one or *2* yeeres if hee had but Incouragement[68]'. Familiar ornamental and culinary plants were likely to have been available from commercial seedsmen and nurserymen[69]. However, for more unusual plants, the Bobarts and Morison had to look elsewhere. Morison was aware of the expense of trying to stock a garden with unusual plants from his time in exile in France: 'ye Duke of Orleance sent but 4 persons with 4 men and horses to seek out strange plants … they found but 3 very strange plants and yt voyage cost ym more - ye Duke - Dr. Modesay thought, yn all ye Gardens [Blois] did beside[70]'. Such elaborate plant-hunting expeditions were unaffordable for a Garden with a limited budget supplemented by the sale of produce in Oxford.

The Bobarts and Morison had to be content with more modest collection expeditions and enlisting personal and institutional contacts across Europe to fill the Garden. The networks of botanical exchange involving Oxford Physic Garden in the seventeenth century have yet to be explored in detail. However, it is clear plants arrived in the Physic Garden through a diverse set of routes. The Bobarts undertook simpling expeditions in Oxfordshire and surrounding English counties[71]. For example, Bobart the Younger grew a white-fruited bramble he had spotted near Oxford[72], whilst in 1658 a specimen of *Cynoglossum germanicum* (green hound's-tongue) was grown which was 'bought from Reading, where it was shewed us by Mr Watlington[73]'.

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[68] See Power, op. cit. (note 3), p. 123.

[69] M. Thick, 'Garden Seeds in England Before the Late Eighteenth Century – II, the Trade in Seeds to 1760', *The Agricultural History Review* 38 (1990), 105--16. J. Harvey, *Early nurserymen: with Reprints of Documents and Lists* (London, 1974).

[70] See Power, op. cit. (note 3), p. 122.

[71] D. E. Allen, *The naturalist in Britain: a Social History* (Princeton, 1984).

[72] P. Miller, *The Gardeners Dictionary: Containing the Best and Newest Methods of Cultivating and Improving the Kitchen, Fruit, Flower Garden and Nursery* (London, 1768).

[73] See Stephens and Browne, op. cit. (note 9). Bobart the Elder herbarium (Specimen Bsn-C32r-04; Oxford University Herbaria).

Internationally, Bobart the Younger was in contact with Pierre Magnol (1638-1715) in Montpellier via John Locke, whilst Paulo Boccone (1633-1704) supplied Robert Morison with Sicilian plants[74]. The Bobarts were also exchanging plants with Guy-Crescent Fagon (1638-1718), Jardin royal des plantes médicinales, Paris, and William Sherard would develop extensive contacts with Leiden in the late seventeenth century[75].

How was the Garden used?

Danby and the University's conceptions of the Oxford Physic Garden were as a space for growing medicinal plants to aid medical teaching and research. However, under the Bobarts, medicinal plants were a small part of the living plant collection. The first formal lecture in the Garden took place on 5th September 1670, when the newly inaugurated Robert Morison stood in the centre of the walled garden and talked about plant classification.[76] Morison was apparently an engaging teacher, although he spoke at a 'gallant rate' and had 'no command of the English, as being much spoyled by his Scottish tone'.[77] His lectures became more sporadic as he focused on the research for this *Historia*.

During their time some teaching about medicinal plants was undertaken by the Bobarts based around the Garden[78]. In 1658, Stephens and Browne justified publication of their Catalogue to the Garden because of 'solicitations of students in Physick & lovers of plants[79]'. However, equal, if not more, interest appears to have been associated with the need to generate income and the science of describing plants and classification systems.

The Bobarts were highly skilled, experimental gardeners interested in anything that might increase income, for example, grafting techniques, nutrient regimes and novel plant selection. Ventures into more philosophical aspects of plant biology proved less successful. For example, they asserted, with authority given their horticultural reputations, that, if left in the soil, 'Crocus' changed into 'Gladiolus'.[80]

Bobart the Younger's horticultural observations led him to suggest single-flowered and double-flowered carnations could be differentiated before they flowered. If true, 'beautiful and profitable' double forms could be cheaply screened from commonplace single forms.[81]

The Bobarts made observations relevant to plant sex, a controversial idea in the seventeenth century[82], but never formalized their conclusions. Bobart the Younger found a white campion with flowers that lacked male parts, and he was aware plants such as

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[74] See Harris and Anstey, op. cit. (note 5). S. A. Harris, 'Introduction of Oxford Ragwort, *Senecio squalidus* L. (Asteraceae), to the United Kingdom', *Watsonia 24* (2002), pp. 31--43.
[75] See Clokie, op. cit. (note 34).
[76] See Vines and Druce, op. cit. (note 10), p. xiii.
[77] A. Clark, *The Life and Times of Anthony Wood, Antiquary, of Oxford, 1632–1695*, vol. e: *1682–1695* (Oxford, 1894), p. 49. See Power, op. cit. (note 3), p. 119.
[78] See Power, op. cit. (note 3).
[79] See Stephens and Browne, op. cit. (note 9), Preface to the Philobotanick Reader.
[80] See Sharrock, op. cit. (note 53), p. 116.
[81] See Sharrock, op. cit. (note 53), pp. 69--70.
[82] See Morton, op. cit. (note 2).

cannabis had individuals that did and did not produce seed.[83] As curators, the Bobarts were enthusiastic sharers of botanical knowledge, contributing to national and international scientific networks. Towards the end of his life, Bobart the Younger was even prepared to sacrifice part of his own herbarium to maintain his relationship with James Petiver (c. 1665-1718) at the Chelsea Physic Garden.[84]

By the end of the eighteenth century, catalogues of the Bobarts' plants were being offered for sale and have been credited with founding seed exchange schemes, although such schemes were established practise among seventeenth-century botanists and gardeners.[85]

Despite criticisms of the Garden's appearance, the University continued to parade distinguished visitors, such as the Prince of Orange (future King William III; 1650-1702), through it[86]. Gentlemen, such as John Evelyn and Elias Ashmole (1617-1692), praised both it and the Bobarts[87].

The work on stocking the Oxford Physic Garden did not begin until the appointment of Jacob Bobart the Elder in 1642, despite completion of the walls in 1633. Between 1648 and 1676, the Garden the Bobarts filled with more than 1,300 Linnaean species was closer to Evelyn's concept of a 'Philosophico-Medical Garden' than a collection of plants focused on medical training[88]. The ornamental and food plants grown by the Bobarts were probably essential to maintain an income for the Garden. However, the vast majority of the plants growing in the Garden were of botanical interest only and illustrated some of the diversity of plants being imported into Britain that could be grown in a temperate climate; few of the species cultivated needed year-round indoor protection.

Acknowledgements

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[83] See Miller, op. cit. (note 71). P. Blair, *Botanisk Essays* (London, 1720), p. 272.
[84] See Dandy, op. cit. (note 3), p. 92.
[85] Letter from Jacob Bobart the Younger to Mary Somerset, Duchess of Badminton, dated 28 March 1694 [British Library; Sloane MS 3343 ff.37r–37v]. 'Mr Bobarts' Catalogue of Plants att Oxon. Plants that may be had of Mr Bobart 1693'. Manuscript in Bobart the Younger's hand [British Library; Sloane MS 3343 f.19]. See Ogilvie, op. cit. (note 1), pp. 174--82.
[86] R. T. Gunther, *Oxford Gardens Based Upon Daubeny's Popular Guide of the Physick Garden of Oxford: with Notes on the Gardens of the Colleges and on the University Park* (Oxford, 1912), p. 180.
[87] T. Hearne, *The life of Anthony à Wood from the Year 1632 to 1672* (London, 1772), p. 221. See Gunther, op. cit. (note 85), p. 180.
[88] See Evelyn, op. cit. (note 22), pp. 403--10.

Figure legends

Fig. 1. Layout of the seventeenth-century Oxford Physic Garden, showing quartering by yew hedges and the 'Conservatory for Evergreenes' in the top right corner. Copper engraving from David Loggan's *Oxonia illustrata* (1675).

Fig. 2. Jacob Bobart the Elder, oil painting by an unknown artist (Department of Plant Sciences).

Fig. 3. Jacob Bobart the Younger, oil painting by an unknown artist (Department of Plant Sciences).

Fig. 4. *Lunaria annua* specimen, probably collected from the Oxford Physic Garden, annotated by Jacob Bobart the Younger in the late-seventeenth century. This species was reported from the 1648, 1658 and 1676 Garden lists (Oxford University Herbaria; Mor-II-245-01).

Fig. 5. Polynomial identification decision tree (‘polynomial pipeline’). A polynomial or synonym in the three garden lists (hexagon) was compared with the labels of the Bobartian and Morisonian herbaria. If the name was present, the plant was identified; if not, the name was compared with those on labels in the Sherardian and Dillenian Herbaria. If the name was not found, synonyms for the name were searched for in published and manuscript works associated with the Bobarts. Any synonyms found were searched for in the Bobartian, Morisonian, Sherardian and Dillenian Herbaria as before; in addition the Dubois herbarium was searched. Only when these routes failed to recover a name match were illustrations or descriptions in early modern English herbals searched. The number of polynomials considered at each category is indicated in the grey rectangle.

Figure 6. Venn diagrams of the number of names in the 1648, 1658 and 1676 Oxford Physic Garden lists, following list editing as described in the main text. A. Linnaean and polynomial names. B. Medicinal plants, according to Linnaean names. C. Native and introduced plants, according to Linnaean names. 'n' is the total number of names in each list.

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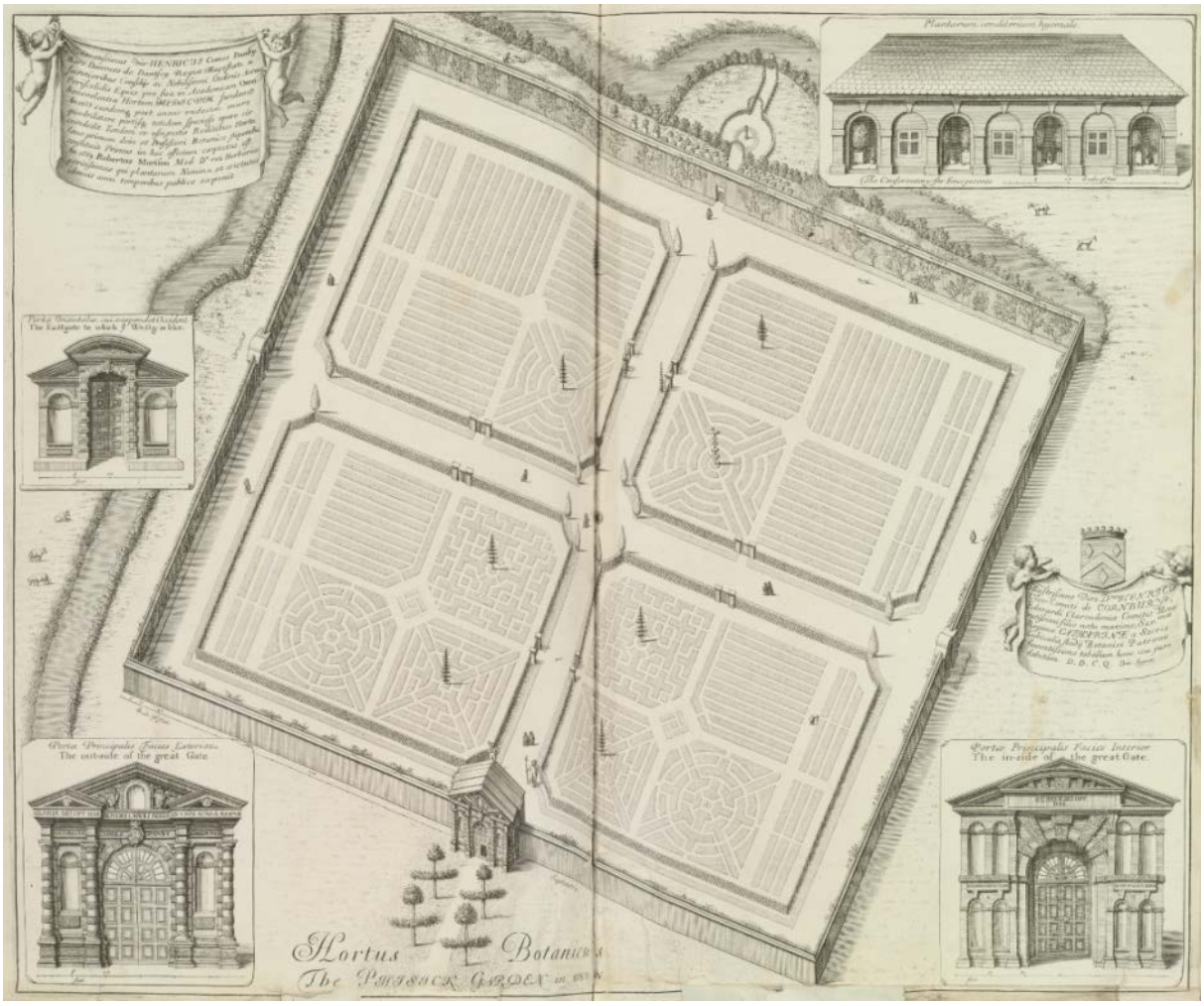

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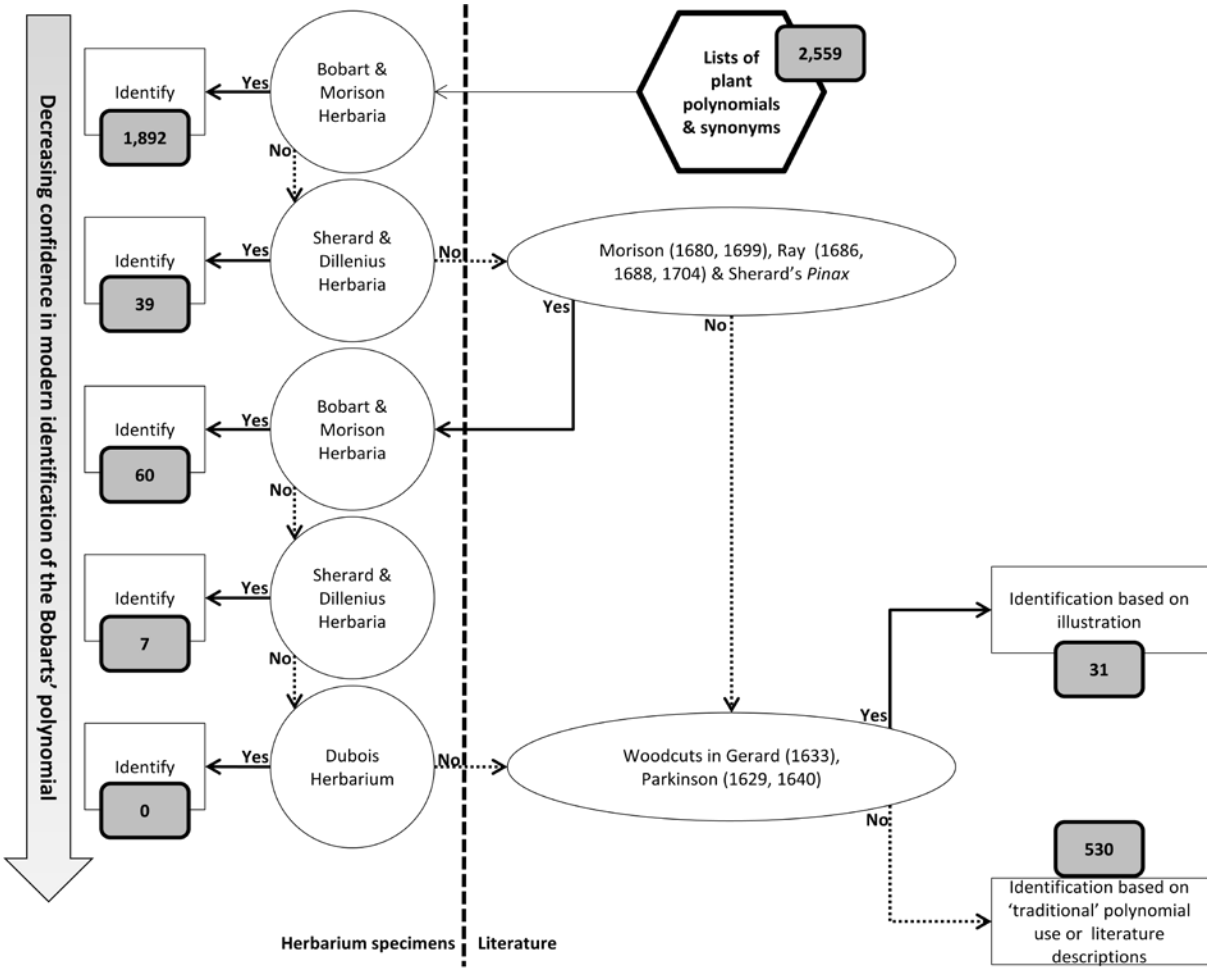

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