NOTES AND RECORDS

Check for updates

Notes Rec. (2020) **74**, 303–328
doi:10.1098/rsnr.2019.0012
Published online 27 November 2019

'THE MOST COMMON GRASS, RUSH, MOSS, FERN, THISTLES, THORNS OR VILEST WEEDS YOU CAN FIND': JAMES PETIVER'S PLANTS

by

CHARLES E. JARVIS*

Department of Life Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, UK

The dried plant specimens painstakingly acquired by the London apothecary James Petiver (*ca* 1663–1718) from around the world constitute a substantial, but underappreciated, component of the vast herbarium of Sir Hans Sloane, now housed at London's Natural History Museum. Petiver was an observant field biologist whose own collecting was focused in south-east England. However, he also obtained specimens from an astoundingly wide geographical area via numerous collectors, more than 160 of whose names are known. While many were wild-collected, gardens in Great Britain and abroad also played a role in facilitating the study of the many new and strange exotics that were arriving in Europe. A new estimate of the number of specimens present in Petiver's herbarium suggests a figure of *ca* 21 000 gatherings. In this article, the appearance of the bound volumes, and the arrangement of the specimens within them, is assessed and contrasted with those volumes assembled by Leonard Plukenet and Hans Sloane. Petiver's published species descriptions and illustrations are shown to be frequently associated with extant specimens, letters and other manuscripts, making the whole a rich archive for the study of early modern collecting of natural curiosities at a time of increasing 'scientific' purpose.

Keywords: Hans Sloane; herbarium collections; James Petiver; *Musei Petiveriani*; seventeenth-century science; eighteenth-century science

INTRODUCTION

The 300th anniversary of the death of James Petiver (*ca* 1663–1718) provides a timely opportunity to re-evaluate his significance as an apothecary, collector, natural historian and virtuoso.[1] However, any assessment of Petiver as a botanist encounters problems because of the difficulty in 'recovering' his own botanical collections from among those of his far better-known contemporary, Hans Sloane (1660–1753).[2] Arnold Hunt aptly describes

*c.jarvis@nhm.ac.uk

1 See Richard Coulton, *Notes Rec. R. Soc. Lond.*, in press.

2 See James Delbourgo, *Collecting the world: the life and curiosity of Hans Sloane* (Allen Lane, London, 2017); Alice Marples and Victoria R. M. Pickering, 'Patron's review: exploring cultures of collecting in the early modern world', *Arch. Nat. Hist.* **43**, 1–20 (2016).

Petiver's extensive archive as existing 'under Sloane's shadow' and has argued that the historical view of him as a disorganized and sloppy collector and 'a man without method' is very wide of the mark.[3] On the contrary, Petiver took a great interest in the debates over botanical method that pitched Joseph Pitton de Tournefort's *Elements de botanique* (1694) against John Ray's *Methodus plantarum nova* (1682) (strongly favouring the latter), and Ray (1628–1705, the 'Father of British botany') evidently had a high regard for Petiver as a botanist, complimenting the latter on having identified numerous errors in Leonard Plukenet's publications.[4] Given the dispersed nature of Petiver's botanical archive, the best way of assessing his botanical contribution is through making a more detailed study of his surviving herbarium collections, alongside the letters and other manuscripts and published work that relate to them. This is the approach adopted in this study.

A herbarium—a collection of pressed, dried plant specimens—is a singular type of archive. Subject to reliable accompanying documentation, each specimen is capable of providing a record of where and when it was growing when collected, giving information on the historical distribution and times of flowering of the species to which the specimen belongs, thereby yielding potentially valuable data. Unlike narrative records, within dried plant specimens lie preserved anatomical, chemical and genetic details that can be mined to reveal information valuable for understanding variability within and between species. Petiver's herbarium collection, most of which survives as part of the herbarium of Hans Sloane (1660–1753) at the Natural History Museum in London (hereafter NHM), is the primary focus of this article.[5] This study of his collection in conjunction with surviving manuscript sources and Petiver's own publications reveals a web of interlinked information, the significance and value of which has previously been underappreciated. I believe that the conventional assertion that Petiver was an unremarkable botanist is incorrect, based as it was on the authority of others, rather than an analysis of his scientific practice and legacy (above all in the shape of his herbarium). This essay provides such an analysis for the first time and demonstrates Petiver's considerable scientific purpose and his significance as a remarkable botanist (as well as a remarkable collector).

The first part of this study explores Petiver's early field-collecting activities, along with those of his fellow collectors in Britain and Ireland, as well as the role played by gardens in developing Petiver's botanical knowledge. Consideration follows of the great efforts he made to convert travellers into his own collectors, resulting in a herbarium showing an unprecedented geographical spread for the early eighteenth century. An analysis of Petiver's collections after their acquisition by Sloane, and their subsequent life as part of the British Museum's collections follows. The physical appearance and arrangement of specimens within Petiver's volumes is analysed, along with consideration of the wide geographical range (and large number of suppliers) from which many of his specimens came. These specimens, with their varied mounts and added labels, lists, engravings and

3 Arnold Hunt, 'Under Sloane's shadow: the archive of James Petiver', in *Archival afterlives: life, death and knowledge-making in early modern British scientific and medical archives* (ed. Vera Keller, Anna Marie Roos and Elizabeth Yale), pp. 194–221 (Brill, Leiden and Boston, 2018).

4 John Ray, Letter to James Petiver, 4 April 1701, Sloane MS 4063, ff. 77–78, British Library, London (BL).

5 Hans Sloane (FRS; PRS 1727–1740), collector, physician, scientist and antiquary, amassed a vast collection of natural and artificial curiosities which formed the core of the founding collection of the British Museum. His natural history collections are now at the Natural History Museum in London (NHM). See Arthur MacGregor (ed.), *Sir Hans Sloane: collector, scientist, antiquary* (British Museum, London, 1994); Alison Walker, Arthur MacGregor and Michael Hunter (eds), *From books to bezoars: Sir Hans Sloane and his collections* (British Library, London, 2012).

drawings, are often linked, sometimes obscurely, with Petiver's own publications. A new estimate of the number of gatherings in Petiver's herbarium volumes (based on a sample of 10% of the folios) is presented, and a selection of specimens are discussed in order to demonstrate the diversity of information that can be retrieved from collectors' labels.

Travel and collecting

The premature death of Petiver's father resulted in James receiving only a brief formal education at the Free School in Rugby before he was sent to London in 1677 to be apprenticed to Charles Feltham, apothecary to St Bartholomew's Hospital. Petiver remained under the latter's tutelage until 1685, before establishing his own apothecary's practice at the White Cross in London's Aldersgate Street.

Following his arrival in London, Petiver joined regular local excursions with fellow apothecaries to collect medicinal plants, and these are prominent among his surviving earlier dried plant collections, now at the NHM. Petiver's medicinal samples include, for example, birthwort (*Aristolochia*, used as an aid to childbirth) and nigella (*Nigella*, utilized for a wide variety of ailments).[6] It is clear from manuscript materials and entries in his publications that he was a keen field biologist and he evidently spent a significant amount of time outdoors, observing and collecting. Though much of this activity took place in the London area (Charlton, Hampstead, Highgate, Hornsey, Kentish Town, Putney Heath and Westminster are frequently mentioned in his manuscripts and publications), there are also observations recorded from further afield. For example, he describes a moss that 'I first observed on the highest rocks in Charley-Forest, Leicestershire', a butterfly that he had caught 'the last summer at Tunbridge', some 'very Curious Fossils I found in a high clay Bank on the Sea side between Limington and Christ-Church in Hawt[Hamp]-shire', and a fossil shell he had found 'about Pool in Dorsetshire'.[7] He visited Bristol in 1712, confirmation of which is provided by a specimen of rock parsley or honewort (*Trinia glauca* (L.) Dumort.) among the Reverend Adam Buddle's specimens in the Sloane Herbarium.[8] Buddle (*ca* 1660–1715) annotated the specimen (figure 1) as having been collected by Petiver ('a D. Petiver collect. in rupem Sti Vincenti, Bristol' [St Vincent's Rocks, Clifton]). A British rarity, this species can still be found today at this locality in the Clifton gorge. Petiver also visited Cambridge and Norfolk in 1715, where he botanized in the company of his fellow apothecary James Sherard (1666–1738), with whom he had planned to travel to Wales in 1717 (his own final illness prevented this).[9]

6 Sloane Herbarium (HS) 202, f. 6 (*Aristolochia*) and f. 29 (*Nigella*) respectively, NHM.

7 'Muscus … Our Rock-hair', in James Petiver, *Musei Petiveriani*, 10 'centuries' (Benjamin Walford, Samuel Smith and Christopher Bateman, London, 1695–1703), century 1 (1695), item 78 (p. 12); 'The black-ey'd marble Butterfly', *ibid.*, centuries 4/5 (1699), item 307 (p. 34); 'Limington Curl'd Cockle', James Petiver, *Gazophylacii naturae et artis*, 10 'decades' (Christopher Bateman, London, 1702–1709), decades 7/8 (1706), p. 7, t. 72, f. 12; 'Great, narrow streakt Pool Cockle', *ibid*., decade 10 (1706), p. 11, t. 93, f. 10 respectively.

8 Adam Buddle was a keen and extremely knowledgeable collector of British plants whose 13-volume herbarium he bequeathed to Hans Sloane: see James E. Dandy, *The Sloane Herbarium* (British Museum, London, 1958), pp. 115–117; Charlie Jarvis, Mark Spencer and Robert Huxley, 'Sloane's plant specimens at the Natural History Museum' in Walker *et al.*, *op. cit.* (note 5), pp. 137–157, at pp. 142–143. The specimen of honewort is at HS 120, f. 4.

9 James Sherard, though a less prolific collector than his elder brother William (1659–1728), botanized with Petiver (see specimens at HS 151, f. 97 (Norfolk) and HS 152, ff. 55, 56 (Cambridge)).

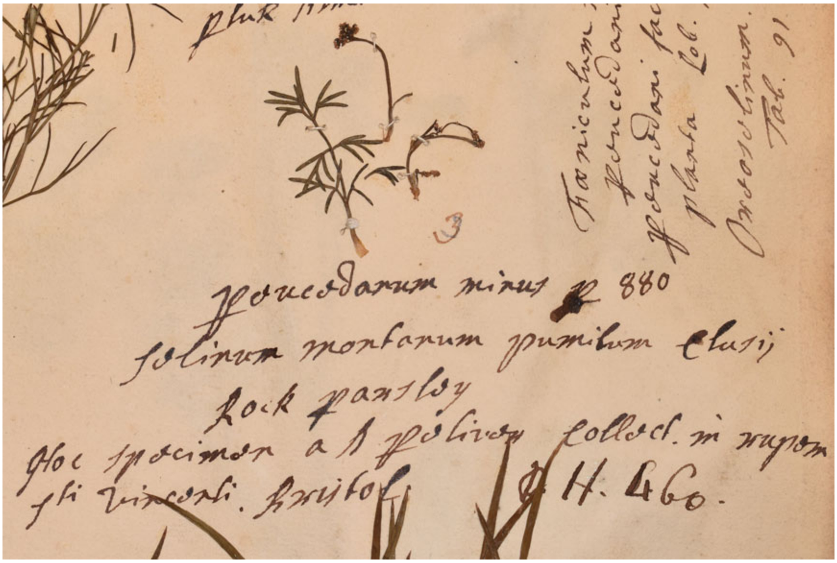

Figure 1. A specimen of honewort (*Trinia glauca* (L.) Dumort.), collected by James Petiver at Clifton, among the collections of Adam Buddle. The later annotation 'R.H. 460' links the specimen with the description of this species in Hans Sloane's annotated copy of John Ray's *Historia Plantarum*, vol. 1, p. 460 (1686), where a reciprocal reference to the herbarium location can be found as a marginal annotation. (From Sloane Herbarium, HS 120, f. 4.) (Online version in colour.)

Other sources of British material

While Petiver himself appears to have botanized chiefly in south-east England, his wide circle of friends and acquaintances included many prominent British collectors and naturalists from whom he received specimens from various parts of Great Britain. They included plants contributed by fellow apothecaries such as Joseph Andrews (*fl.* 1710–1762) in Suffolk, Samuel Dale (1659–1739) in Essex and Samuel Doody (1656–1706), Keeper of the Apothecaries' Garden at Chelsea, as well as clergymen like Adam Buddle and Lewis Stevens (1654?–1724), the latter sending specimens chiefly from Cornwall. Petiver's friend Richard Richardson (1663–1741) sent him material from the north of England, while Scottish plants reached him from the physicians Patrick Blair (1666?–1728) and Charles Preston (1660–1711), as well as James Sutherland (1638?–1719), Superintendent of the Edinburgh Physic Garden. Sir Arthur Rawdon (1662–1695), William Sherard (1659–1728)[10] and the Keeper of the Ashmolean Museum in Oxford, Edward Lhwyd (1660–1709), all contributed material from Ireland, while the latter also supplied specimens from his homeland in Wales.

Sources of cultivated plants

English gardens, whether chiefly ornamental, such as those of the wealthy, or pharmaceutical (physic gardens), were also a potentially rich source of information, and the plants growing in

10 Sir Arthur Rawdon owned an estate at Moira, Co. Down, where William Sherard was in his employ between 1690 and 1694. Specimens collected by them are in HS 300. See E. Charles Nelson, 'Sir Arthur Rawdon (1662–1695) of Moira: his life and letters, family and friends, and his Jamaican plants', *Proc. Rep. Belfast Nat. Hist. Phil. Soc.* 2nd ser. **10**, 30–52 (1983).

them, particularly non-native species and exotics, were studied closely by Petiver. There are numerous references in his letters and publications to visits to various London gardens, along with dried specimens in his herbarium whose horticultural provenance is indicated on their accompanying labels. Petiver himself was closely associated with the Apothecaries' Physic Garden at Chelsea, where he acted as demonstrator from 1709 onwards, during which time he published a series of articles discussing interesting species that were in cultivation there.[11] Other London gardens that were valuable for the newly introduced plants they contained included the Royal Gardens at Kensington Palace and Hampton Court (where Leonard Plukenet (1642–1706) was superintendent of the garden from 1689)[12] and that of Henry Compton (1632–1713), Bishop of London, at Fulham Palace, where George London (d. 1713) was gardener.

There were also a number of commercial nursery gardens, such as those in Hoxton maintained by William Darby (*fl.* 1696–1709) and Thomas Fairchild (1667?–1729) respectively. Petiver described having seen the 'Carolina Poyson Root' in the gardens of both men, 'with whom it has flowred and set for Fruit'.[13] Significant private London gardens included those of the Revd Robert Uvedale (1642–1722) in Enfield, Charles Du Bois (1656–1740) in Mitcham and the merchant Samuel Reynardson (d. 1721) in Hillingdon.[14] Beyond London, Jacob Bobart the younger (1641–1719) contributed material from the Oxford Botanic Garden, where he was the curator, and Petiver seems to have had a particular fondness for the gardens maintained by Mary Somerset, Duchess of Beaufort (1630?–1714), both at her home in Chelsea and at the family's estate at Badminton in Gloucestershire. In connection with a species of *Plantago* known as candy plantain, Petiver observes: 'This long-lost herb I found in her Grace the Dutchess of Beaufort's Garden at Chelsey, whose Nursing Care scarce any Plant (tho' from the most distant Climates) can withstand'.[15] Petiver's interest in facilitating new introductions into cultivation is reflected in the lists of seeds that can be found scattered through his manuscripts, including, for example, 47 species sent by the Revd William Stonestreet (d. 1716) from Aleppo, 'sown AD 1712 & 13 in Mr Fairchild's Garden at Hoxton', and seeds of 101 species sent to Samuel Dale (1659–1739) from Virginia by the collector Mark Catesby (1682–1749).[16]

A significant amount of cultivated material from the Botanic Garden at Padua came into Petiver's hands through his acquisition of two volumes of specimens, probably dating from 1657–1660, that had belonged to William Sancroft (1617–1693).[17] Scattered specimens from other gardens on the Continent can also be found among Petiver's collections, including material from Amsterdam and Leiden, much of which appears to have been

11 James Petiver, 'An Account of divers Rare Plants…', *Phil. Trans. R. Soc. Lond.* **27**, 375–394, 416–426 (1710); **28**, 33–64, 177–221 (1712); **29**, 229–244, 269–284, 353–364 (1714).

12 Petiver, *Musei*, *op. cit.* (note 7), century 1 (1695), item 28 (p. 7), records having seen a Canary Islands fern (*Davallia canariensis* (L.) Sm.) 'growing in his Majesty's Stows [i.e. 'stoves'—hot-houses] at Hampton-Court' in the previous year.

13 Petiver, *op. cit.* (note 11), **27**, at pp. 424–425; a specimen linked with this description is in HS 272, f. 45.

14 Uvedale amassed a considerable herbarium (now composing HS 302–315), as did Du Bois, Treasurer of the East India Company (now in the Oxford University herbaria).

15 Petiver, *op. cit.* (note 11), **27**, at p. 393. The duchess possessed an impressive herbarium (now in HS 131–142). See Dandy, *op. cit.* (note 8), pp. 209–215; Mark Laird, *A natural history of English gardening 1650–1800* (Yale University Press, New Haven and London, 2015), pp. 62–123.

16 James Petiver, Sloane MS 3339, f. 70 (Stonestreet) and ff. 73v–75 (Catesby) respectively, BL.

17 The covers of the volumes in question (HS 172 and 173) carry the arms of the See of Canterbury, where Sancroft was archbishop between 1677 and 1690. Petiver's species list is in Sloane MS 3335, ff. 64–65, BL.

supplied by the German physician Lorenz Heister (1683–1758).[18] In 1711, Petiver made what appears to have been his only excursion to the Continent, travelling to The Netherlands on Hans Sloane's behalf to purchase specimens at the auction of the collections of the late Paul Hermann (1646–1695), who had been Professor of Botany at Leiden University. While there, he visited the Leiden Botanic Garden and collected specimens in the company of Hermann Boerhaave (1668–1738), Hermann's successor as professor.[19]

Instructions to collectors

Without leaving his home in Aldersgate Street in London, Petiver acquired a large number of specimens from a remarkably wide geographical area for the period, obtained from surgeons, physicians, ship's captains, merchants, clergymen and other travellers, as well as other collectors like himself. Recognizing the practical difficulties involved in persuading travellers to provide him with the natural curiosities he craved, he sought to smooth the process by providing potential collectors with relevant materials (chiefly paper, for pressing, in the case of plants), together with instructions aimed to ensure the receipt of good-quality specimens back in London. From about 1690 onwards, Petiver was including detailed instructions in his letters to travellers, especially to those bound for parts of the world whose natural resources were almost unknown in Europe. In his letters, he emphasized the importance of gathering specimens that were 'as compleat & intire as you can', pressing them between sheets of paper to dry and preserve, and recording additional information such as colour and scent, time of flowering and fruiting, medicinal uses and vernacular names.[20] Later, presumably for ease of distribution, he had printed various sets of 'Directions' for collecting natural history specimens, the best known of which is the very detailed 'Brief Directions for the Easie Making and Preserving Collections of all Natural Curiosities' from *ca* 1713. From this, it is clear that, in order to build a collection that would seek to be a comprehensive physical index of global flora, Petiver was happy to receive specimens of both common and rare plant species: 'the most common *Grass, Rush, Moss, Fern, Thistles, Thorns* or vilest Weeds you can find, will meet with the same acceptance as a Scarcer Plant'.

In his efforts to acquire specimens, Petiver was evidently willing to defray the costs incurred by collectors in sending specimens to him. He was also ready to exchange specimens for other items, including books and other publications, medicines and drugs.[21] He seems occasionally to have offered to pay for collections: a Mr Rickets in Antigua, for example, was offered five shillings 'for every Quire of Paper filled with the Fair dryed specimens of any plant there growing'.[22] Apart from financial incentives, Petiver also suggested that the names of those who sent him specimens of new species would appear in print.[23]

18 Examples from Amsterdam include specimens in HS 156, f. 150, and HS 171, f. 161; material from Leiden is in HS 325–328.

19 These specimens are in HS 179, ff. 29–32, 33v, 34.

20 Petiver was not the first to provide instructions (and sometimes incentives) to potential collectors: see Olau Worm, *Museum Wormianum* (I. Elsevierium, Leiden, 1655), and other early instructions reproduced in Arthur MacGregor (ed.), *Naturalists in the field: collecting, recording and preserving the natural world from the fifteenth to the twenty-first century* (Brill, Leiden and Boston, 2018), pp. 917–928. For more on Petiver's collecting instructions, see C. E. Jarvis, '"Take with you a small Spudd or Trowell": James Petiver's directions for collecting natural curiosities', in *ibid*., pp. 212–239.

21 See examples in Hunt, *op. cit*. (note 3).

22 Petiver, Letter to Rickets, March 1708, Sloane MS 3336, ff. 39v–41, BL.

23 Petiver, Letter to Edward Bartar, 16 February 1697, Sloane MS 3332, ff. 247–248, BL.

Petiver's herbarium collections

Petiver evidently lavished considerable time and effort on developing his herbarium collection and, by 1697, he recorded that it contained some 5000–6000 specimens.[24] He was already acquiring much material from other collectors and some of this was exchanged for duplicate material that he had either acquired or collected himself. In this way, specimens that were at one time in his possession can now be found in herbaria other than his own at the NHM. There are, for example, Petiver specimens scattered through the collections of William Sherard, Charles Du Bois and Robert Morison (1620–1683) in Oxford (the last of these assembled by Jacob Bobart the younger). A bound volume of his specimens is present in the Botanical Museum of the University of Florence, apparently sent to Pier Antonio Micheli (1679–1737), botanist to Cosimo III, Grand Duke of Tuscany, in exchange for Italian material that Micheli had supplied to Petiver.[25] Similarly, specimens annotated by Petiver, and presumably exchanged, can be found in the herbarium of Joseph Pitton de Tournefort (1656–1708) at the Natural History Museum in Paris; and Petiver gave specimens to Leonard Plukenet, some of which are in the latter's herbarium (forming HS 83–105 of the Sloane Herbarium). Further specimens have been reported at the Komarov Botanical Institute in St Petersburg, and at the Royal Botanic Gardens in Kew and Melbourne.[26]

Petiver also appears to have been the first to prepare sets of dried specimens for sale (known as *exsiccata*) accompanied by printed labels.[27] Three different collections were available, the *Hortus Siccus Chirurgicus*, the *Hortus Siccus Pharmaceuticus* (HS 202 is an example) and *Botanicum Anglicum, or, The English Herbal*. It is unclear how many of these may have been assembled and sold (it was also possible to buy the printed labels alone) but clearly this would have resulted in a further dissemination of Petiver's plant material during his lifetime.

Petiver's herbarium in Hans Sloane's collection

Following Petiver's death in 1718, his plants, along with the rest of his collections, were purchased by his friend the collector and physician Hans Sloane, Secretary of the Royal Society, from Petiver's sister, Jane Woodcock (*ca* 1668–?1728), and gradually incorporated within Sloane's own herbarium. Presumably on behalf of their new owner, William Sherard prepared a short 'Catalogue of y^{e} late Mr James Petiver's Collections' in which he listed sixteen geographically organized volumes 'bound in calves leather & letterd on y^{e} back', along with a further nineteen 'thin volumes bound in [?blew?] paper', and '48 volumes more'.[28] While the descriptions of many of the volumes make correlations with

24 D. E. Allen, 'Petiver, James (c. 1665–1718)', *Oxford dictionary of national biography* (Oxford University Press, Oxford, 2004), http://www.oxforddnb.com/view/article/22041 (accessed 20 March 2018).

25 Chiara Nepi, 'L'erbario Micheli-Targioni', in *Il Museo di storia naturale dell'università degli studi di Firenze, vol. II le collezioni botaniche* (ed. Mauro Raffaelli), pp. 85–99 (Firenze University Press, Florence, 2009), at p. 87, fig. 3.

26 'Petiver, James (1658–1718)', in *Taxonomic literature II: a selective guide to botanical publications and collections with dates, commentaries and types* (ed. F. A. Stafleu *et al.*), pp. 203–204 (Bohn, Scheltema & Holkema, Utrech), http://www.sil.si.edu/Digital Collections/tl-2/browse.cfm? vol=4#page/217 (accessed 16 March 2019).

27 P. A. Saccardo, 'Petiver's exsiccatae', *J. Bot.* **37**, 227 (1899).

28 Sloane MS 1968, f. 170, BL, unsigned and undated but, as noted by Hunt, *op. cit.* (note 3), p. 207, in the hand of William Sherard. Sherard's list is followed by another (f. 171), in Sloane's hand, of Petiver's printed books.

the modern volumes comparatively easy (e.g. Sherard's '5. Hortus Siccus Capensis' can only be HS 156), Sherard listed 83 volumes, fewer than the 106 indicated by the botanist James Dandy (1903–1976) in his guide to the Sloane Herbarium.[29] Explanations for this discrepancy may include some renumbering and limited reorganizing of the volumes. Sloane stated that Petiver's specimens had been put 'into heaps, with sometimes small labels of Paper, where they were many of them injured by Dust, Insects, Rain, &c.', necessitating Sloane bringing Petiver's collections 'out of the Confusion I found them in'. However, Sherard's list of the Petiver volumes at the time of their receipt, and the absence of evidence of remounting of specimens on Sloane's high-quality mounting paper, suggests that this indiscipline was (as also noted by Hunt) exaggerated.[30] There is no doubt that the vast majority of the Petiver specimens acquired by Sloane remained within the latter's herbarium. At least 160 named collectors, as well as many others whose names were unrecorded, are represented within the Petiver volumes.

Hans Sloane's own field-collecting activities subsided considerably after his return from Jamaica in 1689, and he turned instead to acquiring the accumulated material of other collectors. In this way, plant material came into his hands from Christopher Merrett (1614–1695), Librarian to the College of Physicians, and from William Courten in 1702, followed by an altogether more substantial collection (23 volumes and an estimated 8000 specimens) when he purchased Leonard Plukenet's herbarium in 1710. This was followed by 12 volumes of specimens that had belonged to the Duchess of Beaufort, a friend and neighbour of Sloane in Chelsea, acquired after her death in 1714. However, these not insubstantial earlier collections were dwarfed with the arrival of Petiver's enormous collection—which at the time must have nearly doubled the size of Sloane's herbarium at a stroke. Even given Sloane's continued accumulation of material from other sources between 1718 and his death in 1753, Petiver's material still makes up 106 of the 334 volumes that now constitute Sloane's herbarium.

The specimens that Sloane collected himself in Jamaica (now composing HS 1–8) were systematically arranged following the sequence of species in his *Voyage to Jamaica* (1707, 1725). However, once he started to acquire other whole collections, some of them substantial, he was presented with an indexing problem. To record his continuing acquisition of both natural and artificial curiosities, he generally relied upon a series of manuscript catalogues, each dealing with a different subject area (e.g. 'Gems, Cameos, Annuli', 'Vegetable and Vegetable Substances', 'Shells', 'Catalogus Marmorum', etc.). Most of these survive and provide a broadly chronological record of Sloane's acquisitions, subsequently annotated in ways that suggest how the specimens were accommodated and arranged within his collection.[31] However, Sloane appears never to have maintained a similar chronological catalogue for his herbarium, presumably because, in order to locate individual specimens quickly and precisely among the many thousands it contained, the use of a properly indexed system was required.[32] Accordingly, he started annotating his copy of John Ray's three-volume *Historia Plantarum* (1686–1704), the most comprehensive and detailed systematic treatment of the plant kingdom then available, to

29 Dandy, *op. cit.* (note 8).

30 Hans Sloane, *A Voyage to the islands …Jamaica…*, vol. 2 (London, 1725), p. v; Hunt, *op. cit.* (note 3), pp. 216–218.

31 See Arthur MacGregor, 'Sir Hans Sloane's catalogues', in MacGregor, *op. cit.* (note 5), pp. 291–294; Marjorie Caygill, 'Sloane's catalogues and the arrangement of his collections', in Walker *et al.*, *op. cit.* (note 5), pp. 120–136.

32 The herbarium volumes do, however, feature in Sloane's Library catalogues (Sloane MS 3972A–D, BL).

serve as an index. For example, in the case of honewort, this was done by writing the location of the herbarium specimen (i.e. HS 120, f. 4) in the margin next to Ray's description of the species ('5. *Peucedanum minus* Park.') in *Historia Plantarum* vol. 1, p. 460. In turn, Sloane provided a cross-reference from the specimen by annotating it with the relevant page number ('460') from Ray (see figure 1).[33]

From Bloomsbury to South Kensington

Hans Sloane's vast and diverse collections were one of the principal components in the establishment of the British Museum. Increasing demands on space eventually led to the opening in 1881 of a new building in South Kensington to house his natural history material but the retention of his library and manuscripts in Bloomsbury separated the specimens from their related archival materials, hampering understanding of the interconnectedness of his archive. Sloane's plant collections fortunately attracted the attention of the botanist James Britten (1846–1924), who painstakingly amassed information on their collectors, his findings later forming the basis for James Dandy's invaluable *The Sloane Herbarium*.[34]

Petiver's specimens and their arrangement within the Sloane Herbarium

The presence of Petiver's herbarium within that of Sloane allows comparison to be made with the collections contributed by other collectors. There are undoubted similarities in mounting methods, with the specimens generally attached to the pages using animal glues,[35] with supplementary support sometimes provided by the addition of small paper or linen straps. However, a minority of specimens (notably those of Adam Buddle in HS 114–126) were attached neatly, if rather laboriously, using sewing thread. The paper sheets were gathered in bound volumes (the accepted method of housing dried plant specimens at the time) and it seems that, in most cases, the volumes were simply allocated a Sloane 'Hortus Siccus' volume number and incorporated without any reorganization or remounting of the specimens they contained. This seems at odds with Sloane's account of the disorganized state of Petiver's herbarium when he acquired it in 1718.[36]

The herbarium volumes prepared by Sloane himself are typically rather large and contain pages of good quality, bleached, heavyweight and quite stiff paper providing good support for the specimens mounted on them. The dried plants themselves are often quite large and are typically mounted so that only a single species appears on each page, and the volumes tend to contain specimens from one collector or location. With the exception of Sloane's Jamaican plants (arranged following John Ray's system[37]), they show no signs of following any obvious logical arrangement (either taxonomic or alphabetical).

The 23 volumes of Leonard Plukenet's herbarium are similar to those of Sloane as to size and paper quality (sometimes with the addition of further paper reinforcement on the unbound

33 For further examples, see John Cannon, 'Botanical collections', in MacGregor, *op. cit.* (note 5), pp. 136–149, at pp. 137–138, fig. 37.

34 Dandy, *op. cit.* (note 8).

35 A recipe for such a glue, in Petiver's hand, is in HS 172, f. A: see C. E. Jarvis, 'Seventeenth century collections from the Botanic Garden of Padua in the herbarium of Sir Hans Sloane', *Mus. Scient.* **14**(Suppl.), 145–154 (1998).

36 Sloane, *op. cit.* (note 30), vol. 2, p. 5.

37 John Ray, *Historia Plantarum Species hactenus editas aliasque insuper multas noviter inventas & descriptas complectens*, 3 vols (M. Clark, H. Faithorne and J. Kersey, London, 1686–1704).

edges of the pages). The specimens are carefully placed, frequently four or five to a page, and have been described as 'models of neatness', but they are generally of different species, and are ordered alphabetically by generic name (in line with the arrangement adopted by Plukenet in his *Phytographia* and later publications).[38] As a consequence, they are without any taxonomic or geographical pattern, so specimens of very diverse groups of plants can appear on the same page. For example, because of their alphabetically adjacent names, the large leaves of an arborescent succulent from the family Liliaceae (*Alöe*) and specimens of a tiny herb from the family Caryophyllaceae (*Alsine*) are mounted alongside one another in HS 99, f. 46.

In contrast, Petiver's herbarium volumes are generally smaller than those of Sloane and Plukenet, and are more variable in size. The pages they contain are of coarse, unbleached paper, brownish in colour and rather flimsy and lightweight, which can sometimes carry up to a dozen or more specimens. This is presumably a consequence of Petiver's relative lack of money compared with Sloane and Plukenet, both of whom could afford to use generous quantities of the finest materials for their collections.

There are also significant differences in the way in which at least parts of Petiver's collection are arranged in comparison with those of Sloane and Plukenet. Petiver adopted a geographical arrangement for many of those of his herbarium volumes that contained wild-collected plants: for example, material from continental Europe in HS 147–149, from Britain in HS 150–152, from West Africa in HS 154–155, from the Cape of Good Hope in HS 156, from the Americas in HS 157–159, from the East Indies in HS 160, 161 and 163–165 and from Iberia in HS 166. Within each of these geographical areas, the specimens are organized taxonomically following the classificatory system of John Ray (as Sloane did for his Jamaican collections, the system generally adopted by English botanists of the time). Consequently, a single page in one of these volumes allows the comparison of specimens of a single, or several similar, species, often collected by different people at different times (see figure 2). In contrast to Plukenet, Petiver frequently retained the original labels that had accompanied specimens sent to him. Along with his own labels and annotations, these links with collectors, and dates and places of collection, add considerably to what is known about Petiver and his networks. There are also many specimens that had already been mounted on paper before they reached Petiver, and he generally remounted such specimens in his own herbarium volumes, thereby retaining a further material link with their originators.

Arranging specimens geographically, then systematically, in this way would have presented some practical difficulties. For the folios to be well filled (and without large gaps being left to accommodate future acquisitions in the correct place in the sequence), it would be necessary to wait until a significant number of specimens had been assembled before they could be pasted into the volumes (a similar difficulty would have presented itself to Leonard Plukenet in his use of an alphabetical sequence). However, Petiver recognized this, and space in the folios in seven consecutively numbered volumes (now HS 194–200) was allocated following John Ray's system, allowing specimens to be

38 Leonard Plukenet, *Phytographia sive Stirpium … icones* (published by the author, London, 1691–1694). When Sloane acquired Plukenet's herbarium, the specimens were 'very confused and without Names and references'. Assisting Sloane, Petiver stated 'I have taken some pains about them, and as I knew most of his Correspondents and the greatest part of his collection coming from the same hands I had mine, I find I can go a great length toward the elucidating of them' (Petiver, Letter to William Sherard, 20 September 1710, Sloane MS 3337, ff. 85–86, BL, cited by Hunt, *op. cit.* (note 3), p. 207).

Figure 2. A page bearing five South African *Gladiolus* specimens from different collectors (Henry Oldenland, James Cuninghame, Frederik Ruysch, and John Starrenburgh with William Dampier). (From Sloane Herbarium, HS 156, f. 185.) (Online version in colour.)

incorporated in the appropriate place as they were acquired. As a consequence, the folios of these volumes are only sparsely filled, and also contain many blank pages.

However, there are also volumes of specimens in Petiver's herbarium that do not show this arrangement. HS 174 contains plants collected around London by him *ca* 1683–1684 while he was an apprentice, so it is probably one of the earliest collections that he made.[39] It is a small-format volume, arranged alphabetically with the dried specimen(s) mounted on the recto and the name and synonyms written opposite it/them on the preceding verso. In other volumes, especially those that had been acquired from other collectors, Petiver appears to have decided not to remove the specimens from the volume in order to rearrange them afresh, but to retain the volume with the specimens arranged as received. For example, HS 167 is a herbarium volume prepared by George London (gardener to the Bishop of London at Fulham Palace), in which some of the specimens are arranged following the taxonomic system adopted by Morison, while others are arranged alphabetically.[40] Volumes such as this are frequently accompanied by lists compiled by Petiver to assist in locating particular species within the volume.

Although Petiver's collections (in common with those in the rest of Sloane's herbarium) have been consulted by botanists in the years since they arrived at the British Museum, the absence of a readily usable index to the vast collection has undoubtedly deterred many others. Consequently, while many of the specimens are accompanied by Latin polynomial names coined by Petiver and others, only a tiny proportion of the specimens are provided with modern identifications using Linnaean binomial names.

Geographical range

The geographical range covered by James Petiver's plant collections is impressive. From parts of Europe other than Britain, he possessed collections from Iceland (from the surgeon Evan Evans (*fl.* 1697)), Norway (sent by 'my kind and hearty friend' Richard Wheeler (d. 1699 or 1700)),[41] Riga (through the German physician David Krieg (d. 1713)) and Poland and other parts of central Europe (via the Danzig merchant Jakob Breyne (1637–1697)). From the Low Countries, Petiver acquired material from Jakob's son, Johann Philipp Breyne (1680–1764), and from France via Sébestian Vaillant (1669–1722), Regius Professor of Botany in Paris. He possessed material from Portugal sent by Jezreel Jones (d. 1731), Clerk to the Royal Society, numerous specimens from the Iberian Peninsula and the Balearic Islands collected by the Barcelona apothecaries Jaime and Jaune Salvador, and plants of Gibraltar from Pelham Johnston (*fl.* 1707?).[42] The physician Guillaume Nissole (1647–1734) contributed material from Montpellier, and Petiver's correspondence with Pier Antonio Micheli and the

39 Coulton, *op. cit.* (note 1).

40 Robert Morison, *Plantarum historiae universalis Oxoniensis*, parts 2–3 (Sheldonian Theatre, Oxford, 1680–1699). Specimens in HS 167, ff. 1–87 and 291–527, are arranged following Morison; those on ff. 105–289 are arranged alphabetically. See Alette Fleischer, 'Leaves on the loose: the changing nature of archiving plants and botanical knowledge', *J. Early Mod. Stud.* **6**, 117–135 (2017).

41 See Hunt, *op. cit.* (note 3), p. 216, concerning a moss specimen (*Splachnum rubrum* Hedw.) sent to Petiver by Richard Wheeler (d. 1699 or 1700), figured in Petiver, *Musei*, *op. cit.* (note 7), century 1 (1695), item 70 (p. 11).

42 For more on Jezreel Jones and the relationship with Hans Sloane and James Petiver, see Alice Marples, 'Scientific administration in the early eighteenth century: reinterpreting the Royal Society's repository', *Hist. Res.* **92**, 183–204 (2019), at pp. 188–190. See also Néus Ibáñez, Josep M. Montserrat, Ignasi Soriano and Josep M. Camarasa, 'Plant material exchanged between James Petiver (*ca*. 1663–1718) and Joan Salvador I Riera (1683–1725). I: The Balearic plants conserved in the BC–Salvador and BM–Sloane Herbaria', *Notes Rec. R. Soc. Lond.* **60**, 241–248 (2006).

Abbot of Vallombroso, Bruno Tozzi (1656–1743), yielded interesting Italian specimens.[43] The surgeon Samuel Daniel (d. before 1707) sent Petiver seeds and dried specimens from several of the Greek islands, including Kos, with plants from Cyprus and elsewhere supplied by the Scottish physician James Keill (1673–1719). William Sherard, to whom Petiver seems to have been related, sent specimens from Smyrna, where he was English Consul for some years, and material from Persia came from the ship's captain John Conway (*fl.* 1698–1699). An interesting collection of Middle Eastern plants was contributed by the 'Turkey Me[r]chant' James Braylsford (*fl.* 1700).

Kathleen Murphy has vividly shown the significance of slave trade routes and the role of ship's captains and surgeons in Petiver's acquisition of material from the New World.[44] Richard Planer (*fl.* 1697–1703) and James Skeen (*fl.* 1703), both ship's surgeons, and a clergyman, John Smyth (*fl.* 1695–1697), supplied plant specimens from various slave-trading ports in West Africa, with Planer supplementing them with insects from the coast of Cartagena. A Mr John Dickinson (*fl.* 1696–1700) sent to Petiver what appear to be the earliest-known collections from Bermuda, while Jamaican material was contributed by the physician Henry Barham (1670–1726), and specimens from Barbados by a Quaker, James Reed (*fl.* 1689–1692). Petiver also obtained specimens from the English colonies in North America through clergymen such as Hugh Jones (*ca* 1671–1701) in Maryland, John Banister (1654–1692) in Virginia and Cotton Mather (1663–1728) in New England. Archibald Stewart (*fl.* 1699–1709), a surgeon at the ill-fated Scottish settlement in Darien, sent Petiver assorted ferns from Panama,[45] and George Alfrey (*fl.* 1699–1700), surgeon on one of the expeditions undertaken by Edmund Halley (1656–1742), the Astronomer Royal, contributed an endemic fern from Brazil.[46]

From the eastern Atlantic islands, the Scottish surgeon James Cuninghame sent what is the earliest (1698) substantial collection of plants from the island of La Palma (Canary Islands).[47] Both he and George Stonestreet (*fl.* 1698, brother of the Revd William Stonestreet (d. 1716), who was also a correspondent of Petiver) collected material at St Helena and Ascension, as well as the Cape of Good Hope. The last was already known to be a particularly rich source of horticulturally interesting plant species and Petiver acquired material both directly (e.g. from Paul Hermann, Henry Oldenland (d. before 1699) and John Starrenburgh (*fl.* 1700–1709)) and also via collectors (such as Frederik Ruysch (1638–1731) and Alexander Brown (*fl.* 1692–1698)) and gardens in The Netherlands (e.g. via Lorenz Heister).[48]

The trade routes to the East Indies provided Petiver with opportunities to acquire material from the many places where the English East India Company (EIC) was attempting to establish factories. In India, from Fort St George, the surgeon Samuel Browne (d. before

43 For Micheli, see Dandy, *op. cit.* (note 8), pp. 163–164; Nepi, *op. cit.* (note 25). For Bruno Tozzi, see Dandy, *op. cit.* (note 8), p. 221.

44 Kathleen Murphy, 'Collecting slave traders: James Petiver, natural history, and the British slave trade', *William Mary Quart.* **70**, 637–670 (2013).

45 See Petiver, *Musei*, *op. cit.* (note 7), centuries 6/7 (1699), items 533 (p. 52) (specimens in HS 157, f. 8; HS 329, f. 80), 552 (p. 53) (HS 157, f. 100) and 553 (HS 157, f. 30).

46 *Polypodium trinidadense* Jenman, endemic to the island of Trinidad, Brazil (specimen in HS 163, f. 48).

47 See Arnoldo Santos-Guerra, Charles E. Jarvis, Mark A. Carine, Michael A. Maunder and Javier Francisco-Ortega, 'Late 17th century herbarium collections from the Canary Islands: the plants collected by James Cuninghame in La Palma', *Taxon* **60**, 1734–1753 (2011).

48 Hermann collected extensively in Ceylon and South Africa before taking up the Chair of Botany at Leiden, while the Dane Henry Oldenland was in charge of the Dutch Government's Garden at the Cape of Good Hope from 1695. See Jarvis, *op. cit.* (note 20), pp. 229–233, on Starrenburgh's collections. The Amsterdam 'Anatomick and Botanick' Professor Frederik Ruysch sent Petiver many new plants (chiefly in HS 156) from the Cape; see also a list (Sloane MS 3334, f. 49, May 1701, BL) of plants received from the surgeon Alexander Brown.

1703) and his successor, Edward Bulkley (1651–1714), were particularly assiduous suppliers of specimens of, and information about, medicinal plants. Specimens also reached Petiver from Surat in north-west India via Benjamin Mewse (*fl.* 1695–1699),[49] and from Sri Lanka (via Paul Hermann). The EIC had trading posts in Sumatra (Benkulen), Java (Batavia/Bantam) and Borneo (Banjarmassan), which provided opportunities for Petiver to try to obtain specimens from these places via ship's surgeons and traders. James Cuninghame was among those who obliged, notably from Batavia and Malacca. In addition, he sent Petiver numerous and highly significant collections from China (chiefly Amoy and Chusan), as well as from Cochin-china (present-day Vietnam).[50] Petiver's long correspondence with Georg Kamel (1661–1706), a Moravian lay brother in the Philippine Islands, yielded hundreds of specimens, drawings and detailed descriptions of plants and animals for his collection.[51]

Extent of Petiver's herbarium

The scale of Sir Hans Sloane's herbarium has been variously estimated as containing between 120 000 specimens (Britten) and 300 000 (by the botanist and historian William T. Stearn).[52] As part of the present study, an estimate of the number of collections present in the 106 volumes of Petiver's own herbarium (HS 147–200, 202–204, 247–250, 252–260, 263–290) has been made. Although additional specimens that were annotated by Petiver are present in other volumes of the Sloane Herbarium (notably in HS 325–332), they are comparatively few in number and have been excluded here. The estimate, based on a count of 10% of the specimen-bearing folios in the Petiver volumes, produces a figure of 21 665 gatherings. Assuming that there is, on average, a similar density of specimens present in the other 220 volumes in the Sloane Herbarium, it seems likely that the total number of gatherings is likely to be lower than Britten's estimate, perhaps nearer to 70 000. The estimates of numbers for each of the Petiver volumes are presented in the electronic supplementary material, together with a description of the method employed.

Herbarium arrangement and appearance

The structure and basic arrangement of Sloane's herbarium (and, *inter alia*, that of Petiver), together with brief biographical details of the contributing collectors, have been described by Dandy and Britten.[53] They also reproduced 96 handwriting samples of contributors (drawn chiefly from letters in the Sloane Manuscripts, rather than the more succinct annotations found in the herbarium). However, little attention has previously been paid to the physical appearance of the specimens in their volumes, and the variability in this is particularly striking in the case of Petiver, not least because of the large number of contributors to his collection. For example, many specimens, particularly those from other connoisseurs, were evidently already mounted on paper when Petiver received them, and he dealt with this

49 Letter to the New Company, 12 December 1699, IOE/E/3/55, f. 363, BL.

50 Charles E. Jarvis and Philip H. Oswald, 'The collecting activities of James Cuninghame FRS on the voyage of *Tuscan* to China (Amoy) between 1697 and 1699', *Notes Rec. R. Soc. Lond.* **69**, 135–153 (2015).

51 Sebestian Kroupa, 'Ex epistulis Philippensibus: Georg Joseph Kamel SJ (1661–1706) and his correspondence network', *Centaurus* **57**, 229–259 (2015).

52 James Britten in Dandy, *op. cit.* (note 8), p. 18; William T. Stearn (in MS notula, endpaper, NHM copy of Dandy).

53 Dandy, *op. cit.* (note 8).

situation in a number of ways, sometimes cutting up the original sheets or simply mounting them as supplied, thus retaining any original annotations that the original mounting sheet might have carried. Where specimens were unmounted, any original labels that accompanied them were frequently retained and often supplemented with notes and comments by Petiver (either on the original label or on an additional one).[54]

As has been observed by several authors, Petiver was an inveterate list-maker, and his manuscripts and herbarium volumes are littered with sheets of paper (often mere scraps) crammed with alphabetized lists of specimens from his collectors, or of species abstracted from earlier publications, all in his minute (and sometimes near-indecipherable) hand. As noted by Hunt, Petiver also commissioned images of plants and animals, partly because they could be more easily transported than preserved specimens, and partly to supply images for his own publications.[55] While most of the surviving examples are now to be found in albums among the Sloane Manuscripts at either the British Library or the British Museum, occasional drawings can be encountered mounted alongside specimens in the Sloane Herbarium (as, for example in figure 3).[56]

Petiver's comments, and sometimes obscure abbreviations, often refer to entries in his own publications. Fragments of printed text are frequently pasted next to specimens but it can be difficult to know from which of his numerous publications these might have come. Given the difficulties in reading his often crabbed handwriting, a selection of examples from his herbarium follows, illustrating both his use of cross-references and the varied appearance of specimens in his collection.

Links with Petiver's publications

As his collections grew, Petiver started to publish concise accounts of the specimens he was acquiring (many of them of species previously undescribed). Between 1695 and 1716, nearly 30 articles appeared in the *Philosophical Transactions of the Royal Society* describing plants and animals from places such as Guinea (based on specimens sent to him by the Revd John Smyth), Maryland (from Hugh Jones), Virginia (John Banister), India (Samuel Browne) and The Philippines (Georg Kamel), along with seven describing plants cultivated in English gardens, notably that of the Society of Apothecaries at Chelsea. In parallel, Petiver published *Musei Petiveriani*, a series of ten 'centuries' describing a total of 1000 species (20 of them figured) from a wide variety of sources and geographical areas. The work was published in six parts between 1695 and 1703 and included 800 plants. This was followed by the similar *Gazophylacii naturae et artis* (in which every species was illustrated), published between 1700 and 1711.[57] Further publications included *Catalogus plantarum in hortis siccis Petiverianis* (in the third volume of John Ray's *Historia Plantarum*)[58] and a dozen or so further catalogues and illustrated volumes that appeared between 1711 and 1717.

54 See Jarvis, *op. cit.* (note 20), p. 233, f. 8.7, on Starrenburgh's labels.

55 Santos-Guerra *et al.*, *op. cit.* (note 47), pp. 1735–1737, discuss Petiver's fragmentary lists of Canary Islands collections. Hunt, *op. cit.* (note 3), p. 208.

56 In 1697, Petiver asked James Cuninghame to obtain drawings of Chinese plants which now constitute Add. MS 5292, BL. Several watercolours, missing from that collection, are mounted within volumes at the NHM housing Petiver's East India plants.

57 See Hunt, *op. cit.* (note 3), p. 210, on Petiver's motivation in publishing these two works.

58 Ray, *op. cit.* (note 37), vol. 3, pp. 241–249.

Figure 3. A South African specimen (*Metalasia muricata* (L.) D.Don) with Petiver's label indicating its source ('a D. Lewis collect.'), alongside a pen and ink drawing of it. A simplified version was published as an engraving (*Gazophylacii naturae et artis*, decade 1 (1702), t. 7, f. 3). Petiver's label is partially obscured by a later one in the hand of the Swedish botanist (and pupil of Carl Linnaeus) Daniel Solander (1733–1782), bearing the name 'Gnaphalium muricatum Linn.' (From Sloane Herbarium, HS 156, f. 245.) (Online version in colour.)

Petiver's published texts usually supply some indication of the provenance of the material (generally specimens, occasionally drawings) he was describing, often mirrored in label annotations accompanying the specimens. These labels, though sometimes written by the original collector of the specimen, are more frequently penned by Petiver himself. They typically give a brief polynomial name in Latin for the plant in question, with some indication of its geographical provenance, and often the name of the collector (frequently abbreviated). While a comprehensive listing of the different styles of annotation employed by Petiver is beyond the scope of this paper, a selection, emphasizing his more frequently encountered works, is discussed below.

Musei Petiveriani *(1695–1703)*

A preliminary survey of Petiver's herbarium has shown that approximately 75% of the plant species described in *Musei Petiveriani* (hereafter *Musei*) are represented by specimens, most of them explicitly cross-referenced by Petiver himself using the abbreviations 'Mus. Pet.', 'M.P.' or 'Mus. Nostr.' ('musei nostri'–'our museum'). These appear in conjunction with the relevant species number from the publication (i.e. 1–1000), rather than the page number (in this instance pp. 3–93) on which each occurs. Petiver not infrequently pasted a printed version of the relevant entry, cut from a copy of the work, adjacent to the specimen. In the

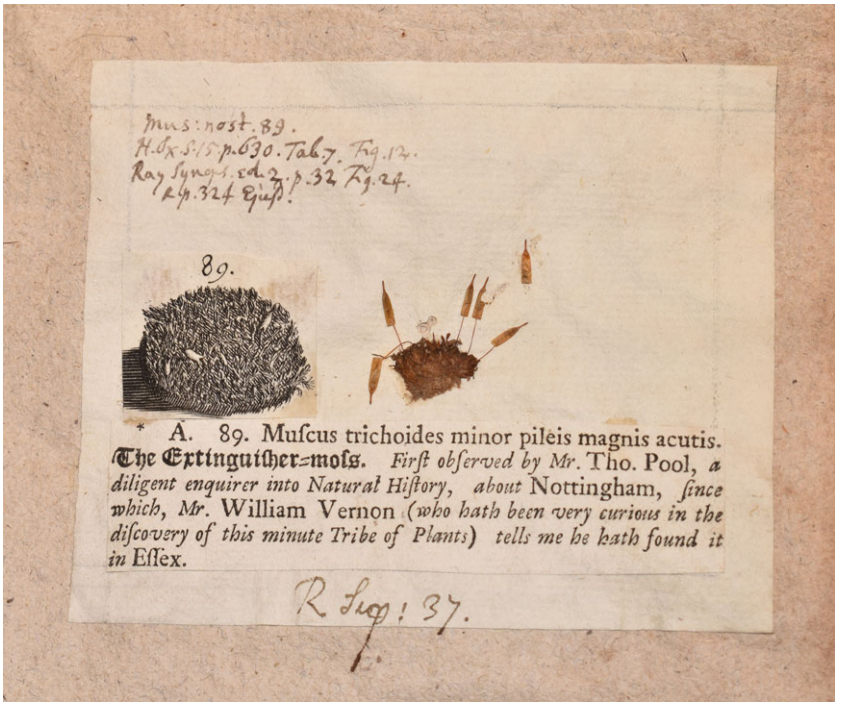

Figure 4. A specimen of 'extinguisher moss' (*Encalypta vulgaris* Hedw.), annotated by Petiver with references to published literature and accompanied by the printed text and illustration cut from a copy of *Musei Petiveriani*, century 1 (1695), item 89 (p. 13). (From Sloane Herbarium, HS 150, f. 60.) (Online version in colour.)

case of 'the extinguisher moss' (item 89, p. 13), for example, the corresponding specimen is accompanied by both the printed text and a copy of the associated engraving (see figure 4). It should be noted that the edition of *Musei Petiveriani* published long after Petiver's death by Millan (1764–1767) omits much of the information on collectors that was present in Petiver's original account.[59]

Gazophylacii naturae et artis *(1700–1711)*

Petiver often indicated correlations between specimens and this publication (translated as *Treasure house of [the works of] nature and art*) by labelling them using the abbreviations 'Gaz. Nat.' or 'G.N.', in conjunction with the number of the plate (in Roman numeral form) and figure (in Arabic numerals). However, specimens can also be linked with the publication in less explicit ways. For example, a plant (in HS 156, f. 245) is accompanied by a label in Petiver's hand indicating its provenance as from the Cape of Good Hope ('a C.B.S.', i.e. 'Caput Bonae spei') and its collector's name ('a D. Lewis collect.') (see figure 3). Mounted alongside the specimen is an unsigned pen and ink drawing, the similarities between the two leaving no doubt that the latter was prepared from the former. A search through Petiver's

59 John Millan, *Jacobi Petiveri Opera, Historiam Naturalem Spectantia* (J. Millan, London, 1764–1767); see Jarvis, *op. cit.* (note 20), pp. 213–214, n. 3.

published figures reveals that a simplified version of the drawing was engraved and appeared in his *Gazophylacii* (decade 1 (1702), t. 7, f. 3). Four years earlier, this plant had been described briefly by him, but not illustrated.[60] However, in neither publication does Petiver mention the name of the collector; the information that this was 'Lewis' comes solely from his label accompanying the specimen.[61] This demonstrates how invaluable additional information can be obtained by linking specimens with publications and manuscript sources.[62]

Catalogus Plantarum in Hortis siccis Petiverianis quae vel ineditae aut hactenus obscure descriptae sunt *(1704)*

This lengthy list (hereafter *Hort. Sicc. Petiv.*) of previously unpublished or hitherto poorly described species of plants that were present in Petiver's herbarium was published on pages 241–249 of the third, supplementary, volume of John Ray's *Historia Plantarum*. The species were ordered alphabetically, then numbered consecutively within each letter group. In his herbarium, Petiver uses the annotation 'Hort. Nost. Sicc.', followed by a letter or number reference, to indicate the link. For example, in HS 248, f. 41, a specimen carries 'P.13' (for '13. Pariti *Malabaric*. Cannabis folio singulari'), accompanied by the corresponding printed text cut from a copy of Ray (p. 246).

Philosophical Transactions of the Royal Society

Petiver published nearly 30 articles describing natural curiosities and, in the case of plants, many of the specimens in his herbarium can be associated with the printed accounts, either through his annotations or via extracts of printed text pasted into the volumes. In 1695, in one of his earliest publications, Petiver described a collection of specimens sent to him from West Africa.[63] Their source was the Revd John Smyth, Minister to the Royal African Company at the English Factory in the Cape Coast, the major business of which was supplying slaves to the New World colonies. The specimens, though sometimes fragmentary, occupy HS 191, ff. 1–23, and are frequently accompanied by the printed text from Petiver's article, which included information on vernacular names and the known uses of the species that featured. John Hall (1932–1984), a botanist with an intimate knowledge of the flora of tropical Africa, provided modern identifications for all of these specimens on slips (dated 1966) pasted into the volume (see figure 5). These specimens, and Petiver's account of them, were fundamental to a recent ethnobotanical study by Soelberg *et al.* comparing historical and contemporary medicinal plant uses in present-day Ghana, which allowed an assessment to be made of the scale of change and loss of medicinal plant knowledge from the late seventeenth century until the present.[64]

In England, there was much interest in the many unfamiliar plants, both medicinal and ornamental, that grew in the New World colonies. Henry Compton, Bishop of London, was a keen natural philosopher who maintained a large garden at Fulham Palace. Requiring a clergyman for the Maryland colony (whom he hoped would also prove an

60 Petiver, *Musei*, *op. cit.* (note 7), centuries 2/3 (1698), entry 144 (p. 21).

61 This is the Revd George Lewis (*fl.* 1698–1702); see Dandy, *op. cit.* (note 8), p. 155.

62 Hunt, *op. cit.* (note 3), p. 219, discusses Petiver's controversial naming of a genus in Lewis's honour.

63 James Petiver, 'A catalogue of some Guinea-plants, with their native names and virtues', *Phil. Trans. R. Soc. Lond.* **19**, 677–686 (1695).

64 Jens Soelberg, Alex Asase, George Akwetey and Anna Katharina Jäger, 'Historical versus contemporary medicinal plant uses in Ghana', *J. Ethnopharmacol.* **160**, 109–132 (2015).

Figure 5. West African tree material (*Triumfetta rhomboidea* Jacq.) from the Revd John Smyth, accompanied by an extract from Petiver's published account based on Smyth's information as to its uses. (From Sloane Herbarium, HS 191, f. 9.) (Online version in colour.)

able natural history collector), he arranged for Hugh Jones, a Welshman recommended by Edward Lhwyd, to take up the position. Jones arrived in Annapolis in July 1696 and reported that the natural products of the country included white cedar (*Chamaecyparis thyoides* (L.) Britton et al.), black walnut (*Juglans nigra* L.), dogwood (*Cornus florida* L.) and sassafras (*Sassafras albidum* (Nutt.) Nees). Petiver described 56 of the plant species that Jones had collected in an article of 1698,[65] specimens of 50 of which were located by

65 James Petiver, 'Remarks on some animals, plants, &c. sent to him from Maryland, by the Reverend Mr. Hugh Jones', *Phil. Trans. R. Soc. Lond.* **20**, 393–406 (1698).

Broome *et al.*[66] As with the Smyth specimens from Ghana, Petiver's printed descriptions often accompany the pressed Maryland specimens.

Turning to India, a number of factories had been established by the EIC to facilitate trade in coastal parts of the subcontinent in the second half of the seventeenth century. Fort St George, founded at Madras on the Coromandel Coast, was prominent among them. Samuel Browne was a talented physician employed there by the EIC as a surgeon; he was also an enquiring collector. As he shared a professional interest in medicinal plants with Petiver, an extensive correspondence developed between the two men, with Browne sending many hundreds of specimens to London, accompanied by notes providing, as Petiver put it, 'their Indian Names, and the Vertues to such as are known to have any'. Based on this material, Petiver published a series of eight articles between 1698 and 1703 (in which he was also highly critical of Plukenet's botanical knowledge). The appearance of the specimens in Petiver's herbarium reflects the relationship between plant and print. For example, a specimen in HS 160, f. 96 ('Nirouri Maderaspat. Hyssopi folio breviore'), apparently on its original mounting paper, is accompanied by a small piece of palm leaf inscribed with a Tamil vernacular name, the annotation 'S.B. 8. 40.' in the top left corner in Petiver's hand, and a piece of printed text cut from Petiver's account of the species (no. 40) in his 'Eighth book of East India plants'.[67] A separate collection of Browne's specimens which he sent to the EIC on his retirement in 1697, and to which Petiver's publication primarily relates, also survives.[68]

Samuel Browne also acted as a conduit for material for Petiver from parts of the East Indies, most notably for collections made by Georg Kamel in The Philippines. Kamel had established himself in Manila in 1688, from where he sent many hundreds of specimens of animals and plants destined for both Petiver and John Ray in England, accompanied by detailed descriptions and drawings in his elegant hand. Petiver published two articles describing plant species received from Kamel, with a third devoted to 20 submarine organisms (chiefly corals) from The Philippines, along with 80 species of plants that Petiver had received from James Cuninghame from Chusan.[69] Many of the specimens on which Petiver's descriptions were based can be located. Typically, they are annotated by him with a label bearing 'CHUS.' and the corresponding species number from the article. For example, a fine specimen of a gorgonian coral (*Annella* cf. *reticulata* (Ellis and Solander, 1786)) from Kamel, corresponding with species number three ('3. Rete Philippense…'), is accompanied by a label bearing the same Latin polynomial, and 'CHUS. 3' (see figure 6).

The important role played by gardens as a source of information about new plants has already been mentioned. Between 1710 and 1716, Petiver published a series of seven accounts of '…divers rare plants, lately observed in several curious gardens about London, and particularly the Company of Apothecaries Physick-Garden at Chelsey'. Specimens linked with these publications are often accompanied by the corresponding printed entry, but the source of the printed information may not be obvious. For example, at HS 272, f. 57, is a specimen of 'Chusan Musk-Mallow' that was grown at Chelsea in the summer

66 C. Rose Broome, George F. Frick, Melvin L. Brown and James L. Reveal, 'A 1698 Maryland florula by the London apothecary James Petiver (*ca.* 1663–1718)', *Huntia* **7**, 61–90 (1987). The specimens are chiefly in HS 158, 159 and 264.

67 James Petiver, 'The eighth book of East India plants, sent from Fort St George', *Phil. Trans. R. Soc. Lond.* **23**, 1450–1460 (1703), at p. 1458.

68 Charles E. Jarvis, 'A seventeenth-century collection of Indian medicinal plants in the Natural History Museum, London', *J. Dept Museology, Univ. Calcutta* **11–12**, 87–98 (2016); see also Alice Marples, *Notes Rec. R. Soc. Lond.*, in press.

69 James Petiver, 'A description of some coralls, and other curious submarines…', *Phil. Trans. R. Soc. Lond.* **23**, 1419–1429 (1703).

Figure 6. A specimen of a gorgonian coral (*Annella* cf. *reticulata* (Ellis and Solander, 1786)), sent from The Philippines by Georg Kamel, with Petiver's label ('CHUS. 3') indicating its link with his description in *Phil. Trans. R. Soc. Lond.* **23**, 1419 (1703). Until the nineteenth century, species of coralline algae and corals were frequently confused and misidentified as either plants or animals respectively. (From Sloane Herbarium, HS 153, f. 101.) (Online version in colour.)

of 1709 or 1710. The printed label that accompanies it is from Petiver's second article on garden plants, where the original supplier of the seed is given as James Cuninghame.[70]

Years after Petiver's death, the Swedish systematist Carl Linnaeus (1707–1778) cited many of Petiver's published illustrations, chiefly from *Gazophylacii*, in his *Species Plantarum* of

70 Petiver, *op. cit.* (note 11), **27**, 417, no. 64.

1753. This work introduced the consistent use of binomial nomenclature for plants, and Petiver's illustrations serve as nomenclatural types for the modern scientific names of a number of Linnaean species (including the fern *Acrostichum sorbifolium* L. and the orchid *Epidendrum carinatum* L.). Linnaeus also commemorated Petiver in the name of the New World genus *Petiveria* (Phytolaccaceae).[71]

Collectors and labels

The locality information associated with specimens prepared in the late sixteenth and early seventeenth centuries only rarely offers much in the way of detail. However, Petiver's collections, including specimen labels, manuscript notes and letters, often contain informative material, and a small selection of examples follows to illustrate this. The labels of collectors such as Richard Richardson can give detailed accounts of the discovery of rarities, as in the case of the search for flowering specimens of the rare Snowdon lily in North Wales.[72]

Further afield, the historical context in which the collector was working is likely to prove more helpful than any information on a specimen label. Ministers, ship's captains and surgeons working at trading stations in Asia or Africa, for example, would rarely have had the opportunity to travel far from their vessel or factory, so any collections would almost inevitably have been made at or close to their temporary home. Similarly, dates of collection only rarely appear on specimen labels. However, information from other sources can often delimit the possible time of collection. For example, James Cuninghame made a few collections on the island of Ascension with no indication of when this took place accompanying the specimens. However, in a separate manuscript account, he recorded that he had collected four species of plants on the island on 4 May 1699.[73]

Occasionally, detailed information can be found in the herbarium itself. Collections from the North American colonies are often sparse in such data but an exception is that of the Revd Joseph Lord (1672–1748), a pastor at Dorchester, South Carolina. An example of one of Lord's lengthy labels (figure 7), in his neat and delightfully legible hand, includes descriptive material ('it has an hoary & smooth Leaf'), uses ('a sort of Tea'), vernacular names ('Sugar-grass' or 'Deer's-grass'), ecology ('it grows both in Pine-land & Savanna's') and date of collection ('Gathered, July 31. 1704').

One of the earliest, explicitly dated specimens in the Sloane Herbarium as a whole (HS 329, f. 123) is from Flores, one of the Lesser Sunda islands in Indonesia, whose label (written by Petiver) records that it was one of a number collected by the surgeon Sylvanus 'Landman' (more usually 'Landon', *fl.* 1679–1701) on 11, 13 and 14 December 1679. Given the early date of these collections, it seems highly likely that Landon was collecting either for himself or for someone other than Petiver (who would have been in his mid-teens at the time), with the specimens now in Petiver's herbarium presumably coming into

71 Carl Linnaeus, *Species Plantarum* (L. Salvius, Stockholm, 1753). Petiver is commemorated in the names of several species including *Mesembryanthemum petiveri* L. and *Erica petiveri* L. For more on Linnaean binomials and the incidence of published illustrations as types, see Charlie Jarvis, *Order out of chaos: Linnaean plant names and their types* (Linnean Society of London with the Natural History Museum, London, 2007), pp. 103–166.

72 The specimens (*Gagea serotina* (L.) Ker Gawl.) are at HS 124, f. 30, and HS 152, f. 156. See Lorenzo Perruzzi and Charles E. Jarvis, 'Typification of Linnaean names in Liliaceae', *Taxon* **58**, 1359–1365 (2009).

73 The specimens are in HS 256, f. 61, and HS 273, f. 10; the description is in Sloane MS 2376, f. 118v, BL. See Jarvis and Oswald, *op. cit.* (note 50) on Cuninghame's voyage.

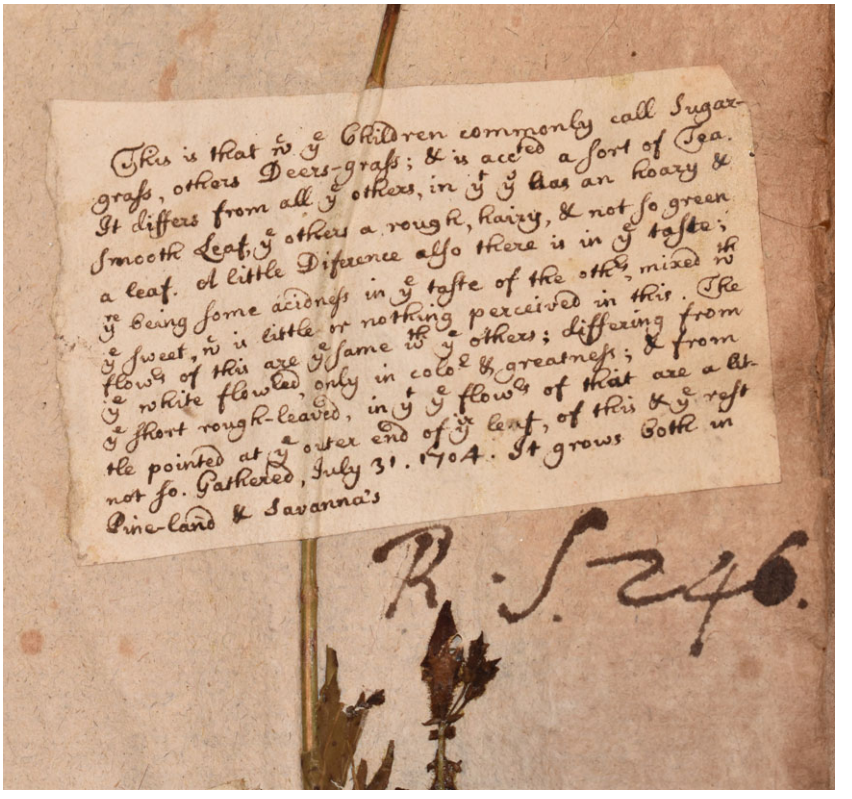

Figure 7. An unusually informative specimen label from Joseph Lord sent from South Carolina, the specimen ('Sugar-grass' or 'Deers-grass') having been collected on 31 July 1704. (From Sloane Herbarium, HS 284, f. 79.) (Online version in colour.)

his hands somewhat later. Landon seems to have collected widely, with specimens attributed to him from Iberia, South Africa and Indonesia.

Samuel Doody, Petiver's fellow apothecary and Keeper of the Apothecaries' Garden at Chelsea, with whom Petiver was on affectionate terms, was another keen collector whose specimens are widely scattered through the volumes of Sloane's herbarium. Among them are collections from beyond Britain, some evidently already mounted when Petiver acquired them.[74] In HS 160, f. 33, for example, is material of a *Potamogeton* from India carrying a number (393) in Doody's hand, and references by Petiver to his *Gazophylacii* (decade 3 (1704), t. 32, f. 11) and *Hort. Sicc. Petiv.* (as 'P[otamogeton]. [number] 65').[75] The jagged outline of Doody's original mount suggests strongly that specimens such as this were previously mounted several to a larger sheet, from which they were cut (probably by Petiver) to allow an arrangement in his herbarium more to Petiver's taste.

The presence of specimens accompanied by a running number is also evident in collections made by Walter Keir (*fl.* 1699), an EIC surgeon who collected specimens in Malacca and

74 Petiver, Letter to Doody, Sloane MS 3333, f. 57, BL; copy of letter dated 10 August 1699, signed 'Yr Loving Cuckold'. Petiver, Letter to Jacob Bobart, Sloane MS 3335, f. 56v, BL; copy of letter dated 2 January 1707, 'I have purchased most of Mr Doodyes Plants'.

75 Ray, *op. cit.* (note 37), vol. 3, p. 247.

Figure 8. A specimen of oleander (*Nerium oleander* L.) collected by James Braylsford in the Middle East, accompanied by its vernacular name in Arabic (as well as in the more familiar English, French and Latin). (From Sloane Herbarium, HS 183, f. 119.) (Online version in colour.)

China. The specimens carry labels handwritten and numbered by Petiver, with both the numbers and the Latin names corresponding with a list ('July 29. 1700. Mr Keir gave me ye following Plants') made by Petiver.[76]

76 Specimens in HS 269, ff. 1–12; list in Sloane MS 3334, f. 59v, BL.

A particularly unusual set of specimens was contributed by James Braylsford, described by Petiver as a 'Turkey Me[r]chant' who had presented him with 'Four Books of Plants which he gathered about Jerusalem, the Mountains of Bilan and on the banks of Euphrates and Jordan'.[77] The specimens (in HS 183) are notable in that their labels bear the name of each species not only in English, French and Latin but also in Arabic (see figure 8).

Conclusion

Despite his modest origins, with determination and focus James Petiver became a prominent London apothecary, a friend and associate of influential natural philosophers (and, through his association with Hans Sloane, an active and significant Fellow of the Royal Society) and a highly knowledgeable collector with a formidable technique for acquiring natural curiosities. Although lacking the financial resources that had enabled wealthy men such as William Courten (1642–1702) to amass expensively acquired collections of natural and artificial curiosities,[78] what Petiver lacked in buying power, he more than made up in drive and determination. His enthusiastic pursuit of natural history objects from around the world, chiefly through the painstaking development of a network of several hundred contacts among fellow apothecaries, clergymen, surgeons, ship's captains and other travellers (rather than through simple purchase), resulted in him having amassed a collection of many tens of thousands of specimens by the time of his death in 1718. These specimens were far more to him than mere objects for display, for Petiver was a keen field observer of natural history.

In framing and distributing his 'collecting instructions', he engaged ordinary people of a similar unprivileged social status in his project, and his promotion of the preparation of specimens of a higher standard in turn facilitated a better quality of scientific description and understanding in Britain. The methods of organization that he adopted for his very large collection of specimens provided a more sophisticated and useful solution than, for example, the alphabetical system used by Leonard Plukenet and, in terms of scientific usefulness, Petiver's adoption of a geographical and taxonomic arrangement proved far more informative than those of many of his contemporaries. His specimens of previously unknown exotic species did not languish unseen in his herbarium volumes but were used as the basis for published descriptions and engravings, making the results available to a far wider audience.

The present study has been an attempt at mapping, in some detail, Petiver's extraordinary collection and methods of work. This has been done by identifying and interpreting Petiver's own herbarium (within Sloane's collection) as a set of botanical objects and knowledge, something that appears not to have been attempted previously. This reveals innumerable instances where his preserved plant specimens can be confidently associated with complementary correspondence or other manuscript materials, alongside his published descriptions and illustrations of the species in question. In addition, for the first time, a detailed estimate has been made of the extent of Petiver's herbarium, revealing that it

77 Petiver, *Musei*, *op. cit.* (note 7), century 8 (1700), p. 79.

78 William Courten (or Charlton) maintained an extensive (and expensively acquired) museum at Inner Temple: see Dandy, *op. cit.* (note 8), pp. 115–117; Sachiko Kusukawa, 'William Courten's lists of "things bought" from the late seventeenth century', *J. Hist. Coll.* **29**, 1–17 (2017).

consists of approximately 21 000 gatherings. Given the high proportion of Petiver volumes now within the Sloane Herbarium, this also suggests that a corresponding figure for the latter is likely to be markedly lower than the estimate of 120 000 provided by Dandy.

Taken together, the data provided in this study provide a new insight into Petiver's practices. In particular, many of the criticisms made of Petiver (for example, that he was haphazard, scatty, disorganized, undiscerning) seem grossly unfair and largely unfounded. Hans Sloane's strictures concerning the disorganized state in which Petiver's plants reached him seem at odds with William Sherard's description of them ('in order and together') following Petiver's death. Arnold Hunt has suggested that Sloane's description of a collection unsuitable for loan may well have been designed to prevent Sherard from borrowing Petiver's herbarium. The fact that the vast majority of Petiver's herbarium volumes appear (on the basis of examination for this study) to have been incorporated largely as Sloane inherited them in 1718 seems to support this argument. Hunt argues convincingly that 'Petiver was far more interested in method and organization than modern scholars have been prepared to allow' and the present study, too, has shown that Petiver was very far from being the disorganized dilettante that many have made him out to be.

Acknowledgements

I am most grateful to Richard Coulton and Fiona Wild for varied help and advice in the preparation of this article, and for the helpful comments and suggestions of the other contributors to this special issue, as well as those of three anonymous referees. Grateful thanks are due to Mark Carine for providing access to the Sloane Herbarium, while Fred Rumsey, Nadia Santodomingo, Brian Rosen and Kaveh Samimi have been generous in sharing their specialist knowledge to confirm the taxonomic identities of specimens discussed here. Lastly, valuable information concerning the Petiver family history has been generously provided by Elizabeth Stockdale, a direct descendant of James Petiver's sister, Jane Woodcock. Figures 1–8 are from the collections of the Natural History Museum, London, and are here licensed under a Creative Commons Attribution licence (CC-BY).