

Lives and Afterlives of the *Lithophylacii Britannici ichnographia* (1699), the First Illustrated Field Guide to English Fossils*

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Abstract:

The *Lithophylacii Britannicii ichnographia* [British figured stones] (1699) by Edward Lhwyd, the second keeper of the Ashmolean Museum, was the first illustrated field guide to English fossils. We analyse this book's physical creation — the collection of specimens, their engravings and their use and reuse in eighteenth-century editions and collections that were in the transition to binomial taxonomy. With particular concentration on the *Lithophylacii's* illustrations of fossils, this paper will first analyse how the specimens were collected. We will then examine the use of these specimens and subsequent editions of Lhwyd's book, with a focus upon how the relationship between them was drawn on by collectors such as Sir Hans Sloane and Daniel Solander from 1680 to 1760. Finally, we will demonstrate how Ashmolean Keeper William Huddesford repurposed the illustrations for Lhwyd's book for his eighteenth-century edition of the field guide, incorporating new classificatory schemes. Our analysis will give insight into how a late seventeenth-century book of natural philosophy was used and

* BL = British Library; Bodl = Bodleian Library; LMA = London Metropolitan Archives; NHM = Natural History Museum, London.

Acknowledgements: Anna Marie Roos would like to thank the anonymous reviewer of the article, the editors, Antonio Clericuzio, Alexandra Franklin, Keith Moore, and her co-author Edwin Rose. Edwin Rose thanks Nick Jardine, Sachiko Kusakawa and Simon Schaffer for their generous and insightful discussions on the subject matter of this paper, my co-author Anna Marie Roos and the anonymous reviewer. For access to the various collections at the Natural History Museum, I thank Consuelo Sendino, Mark Carine and the staff of the Library and Archives. For generously funding this research, I am grateful to the AHRC and Churchill College, Cambridge.

repurposed by natural historians and collectors before and during the development of Linnaean taxonomy.

Keywords: Edward Lhwyd; fossils; taxonomy.

The *Lithophylacii Britannicii ichnographia* [British figured stones] (1699) by Edward Lhwyd (1660-1709), the second keeper of the Ashmolean Museum, was the first illustrated field guide to English fossils. Several authors have analysed it for its theories about fossil formation in an era where species extinction was heterodox, or placed it in the early modern tradition of chorographic analysis of the landscape. Others, like Hellyer, have looked at the material culture of the finished book to ascertain how it informed museum collecting and fieldwork.¹ Less attention, however, has been devoted to the physical creation of this book of early modern natural philosophy — the collection of specimens, their engravings and their use and reuse in eighteenth-century editions and collections that were in the transition to the new binomial taxonomy. Lhwyd's field guide continued to be a valued source despite changes in the approach to classifying and naming natural history specimens which emerged following publications such as the first edition of *Systema Naturae* (1735) and the onset of binomial nomenclature in the 1750s. With particular concentration on the *Lithophylacii*'s illustrations

¹ Robert T. Gunther, *Early Science in Oxford*. Vol. XIV, *Life and Letters of Edward Lhwyd Second Keeper of the Musaeum Ashmoleanum* (Oxford: Clarendon Press, 1945); Melvin E. Jahn, "The Old Ashmolean Museum and the Lhwyd Collections," *Journal of the Society for the Bibliography of Natural History*, 1966, 4:244-248; Id., "A Note on the Editions of Edward Lhwyd's *Lithophylacii Britannicii ichnographia*," *Journal of the Society for the Bibliography of Natural History*, 1972, 6/2:86-97; Brynley F. Roberts, "'Memoirs of Edward Lhwyd, Antiquary' and Nicholas Owen's British Remains, 1777," *National Library of Wales Journal (Cylchgrawn Llyfrgell Genedlaethol Cymru)*, 1975, 19/1:67-87; Marcus Hellyer, "The Pocket Museum: Edward Lhwyd's Lithophylacium," *Archives of Natural History*, 1996, 23/1:43-60. For afterlives of the *Lithophylacii* in America, see Jane P. Davidson, "A Tale of Four Lhwyds: Early Research Materials on Fossil Marine Vertebrates Available to Edward Drinker Cope in Philadelphia Prior to 1868," *Transactions of the Kansas Academy of Science*, 2011, 114/1-2:124-128. For Sir Hans Sloane's collection of Lhwyd's chorographic letters written when he was on progress through Celtic Britain and Wales, see Elizabeth Yale, "Playing Archival Politics with Hans Sloane, Edward Lhwyd, and John Woodward," in *Archival Afterlives: Life, Death, and Knowledge-Making in Early Modern British Scientific and Medical Archives*, edited by Vera Keller, Anna M. Roos, Elizabeth Yale (Leiden: Brill, forthcoming 2018).

of fossils, this paper will first analyse how the specimens were collected via correspondence and Lhwyd's fieldwork. We will then examine how the information was collated and made ready for publication. We will then examine the use of these specimens and subsequent editions of Lhwyd's book, with a focus upon how the relationship between them was drawn on by collectors such as Sir Hans Sloane and Daniel Solander from 1680 to 1760. Finally, we will demonstrate how Ashmolean Keeper William Huddesford (1732-1772) repurposed the illustrations for Lhwyd's book for his eighteenth-century edition of the field guide, incorporating new classificatory schemes. Our analysis will give insight into how a late seventeenth-century book of natural philosophy was used and repurposed by natural historians and collectors before and during the development of Linnaean taxonomy. We will concentrate upon the implications of migration of knowledge of nature from one medium to another, from object to drawing to printed image, as well as the circulation of knowledge and the establishing of credibility and taxonomic type characteristics in scientific (visual and textual) discourse and illustration.

1. Specimen Collection and Fossil Expeditions

Although originally conceived as a guide to Oxford fossils, Lhwyd's *Lithophylacii*, a study in Latin of "formed stones," was "arranged as a drawer-by-drawer guide to the cabinet of fossils which the author had collected and had deposited in the Ashmolean as... keeper."² Lhwyd arrived in Oxford as a poor student, receiving his training in botany through his father's gardener, Edward Morgan, who had been a student of Robert Morrison, the Professor of Botany at Oxford. He was not a wealthy man, his lithoscopic journeys to find fossils limited due to his duties at the Museum. Lhwyd wrote "my place requireing constant attendance, I have onley schoolmaster's leasure to go abroad," and so he relied on physician and naturalist

² Arthur MacGregor, "William Huddesford (1732-72): The Ashmolean Museum, his Collections, Researches, and Support Networks," *Archives of Natural History*, 2007, 34/1:47-68, p. 57.

Martin Lister (1639-1712) to find him subscribers to produce the work as well as to pay “searchers” to find specimens.³ Lhwyd and Lister were close friends, and about 200 pieces of correspondence between them survive that give a detailed account of the production of the *Lithophylacii*.⁴ Lhwyd helped Lister by displaying Lister’s own works on malacology at the Ashmolean and selling them to visitors; on 1 July 1690, Lhwyd wrote Lister: “As yet I have sold but one Cobby of the Conchyliia... I hope by degrees to get these off, especially if any curious forreigner shall visit our Musaeum.”⁵ It was thus a mutually beneficial arrangement between two friends and natural philosophers.

Lhwyd first mentioned to Lister his plans for a field guide in a letter of 28 April 1691, noting “I have something to say to you in my next about a Lithologia Oxon. or a small tract of such figured stones as may be found within 20 miles of Oxf. whether Oxf.shire or Berkshire & Buckinghamshire.”⁶ Lhwyd had been gathering fossils for some time in the environs of Oxford, sometimes on solo expeditions, sometimes taking foreigners to fossil sites for pay, sometimes with fellow natural philosophers such as James Petiver (c. 1665-1718). On 1 July 1690, Lhwyd reported finding in a gravel pit near Oxford, an “elegant kinde of stone, in shape like a Button mold,” a fossilised coral *anabacia complanata* that Robert Plot had previously illustrated in table eight, figure nine of his *Natural History of Oxfordshire* (1676).⁷ Both specimens were from the Great Oolite Series of limestone that Plot found in Taynton, Gloucestershire. On 9 December 1690, Lhwyd mentioned to Lister that he had found *Dentalis scissilis cunieformis* (sea urchin spines) in Oxford, as well as *cornu ammonis*, or casts of the gas chambers of ammonites. These finds were accompanied on 18 December 1690 by fossilised *Pholas* shells that he sent to Lister, which were subsequently depicted in the

³ Bodl. MS Lister 3, f. 146. Dated May 1690.

⁴ The author is preparing volume two of Lister’s correspondence where this exchange will feature, to be published by Brill.

⁵ Bodl. MS Lister 36, ff. 11-12. The letter was dated 1 July 1690.

⁶ Bodl. MS Lister 36, f. 22. The letter was dated 28 April 1691.

⁷ Bodl. MS Lister 36, ff. 11-12. The letter was dated 1 July 1690. Gunther, *Early Science in Oxford* (cit. note 1), p. 105.

appendix of fossils to Lister's *Historiae Conchyliorum* (1685-1692) as *Pholas mytalopdes marmoreus*, and were also illustrated eventually in Lhwyd's *Lithophylacii* as figures 877 and 878.⁸

To accumulate specimens for his guide, Lhwyd went on an expedition the following summer with James Petiver (c. 1665-1718), a botanist and entomologist who, with the patronage of Sir Hans Sloane, became apothecary to the Charterhouse in 1700, establishing an independent shop at White Cross Street, Aldersgate. Petiver was an inveterate collector of naturalia: "By 1697 Petiver's herbarium alone amounted, on his own reckoning, to between 5000 and 6000 specimens, and he was ready to start reaping some scientific acclaim for the huge investment of time and effort by describing in print some of the contents of the by then famous Museum Petiverianum."⁹ At his decease, Sloane bought his library and collection for £4000; some 200 volumes of his *hortus siccus* [albums of dried plants] are now in the Sloane herbarium at the Natural History Museum in London.

Petiver recorded in his diary that he went on a natural history expedition in the summer of 1691, during the course of which he spent time in Oxford. He noted:

My business in this City was, To see the Colledges, and their Liberaries, the Physick Garden; Museum, and the Laboratory, and what other Rarieites I could see. I staid ten daies here, 5 daies I spent in viewing the places above said, and what other Rarieties the City did afford me, the other 5 daies I spent with the Ingenious Mr Floyd keeper of the Museum, we went about Thirty miles into the Country, a Lithoscoping

⁸ Bodl. MS Lister 36, ff. 18-19; Gunther, *Early Science in Oxford* (cit. note 1), p. 115.

⁹ D.E. Allen, "Petiver, James (c.1665-1718)," *Oxford Dictionary of National Biography*, <https://doi.org/10.1093/ref:odnb/22041>. Petiver was an early member of the influential group of naturalists who met regularly at the Temple Coffee House. Some of this material on Petiver is adapted from Anna M. Roos, "Only meer Love to Learning: A Rediscovered Travel Diary of Naturalist and Collector James Petiver c. 1665-1718," *Journal of the History of Collections*, November 2017, 29/3:381-394.

[or Gathering formed Stones].¹⁰

“Mr Floyd” was Lhwyd, and in a letter to Lister of 16 June 1691, Lhwyd wrote:

I formerly told you I had some thoughts of attempting a *Lithologia Oxoniensis* whereby I meant a Methodical Enumeration \& Description/ of such stones as I could discover w[–]ithin 20 or 30 miles of Oxford, without any respect had to Countys. considering first their matter ex. gr. Free stone, flint, Peble, Selenite, fluor, Siderites &c. & then their figures. Mr Ray approves of the Design very well, but would not have me confine my self to so narrow a compasse; but take in all of my knowlege that may be found in England. I answer that [–that] a *Lithologia Britannica* might indeed be a Book of very good use both in regard of the Discoverys that would be made...¹¹

As Petiver began his peregrinations in late July, their joint field expedition for the creation of Lhwyd’s *Lithophylacii* probably took place the following month. Indeed, on 25 August 1691, Lhwyd wrote to Lister:

I shall shortly have leasure [–to] enough to be absent from the Museum; & then I designe to table¹² my self one week at Cirencester, & an other at Gloucester; leaving a Friend in the mean while at the Museum. I think I mention’d in my last a curious tooth-stone somewhat of the bignesse & shape of a ravens beak; very elegantly streaked lengthways with eminent striæ: & of a bright shineing atrorubent colour; which I had found in a gravelpit at Faringdon a market Town of Berkshire. I have

¹⁰ London Metropolitan Archives, “Diary of James Petiver,” f. 5r. LMA/4521/C/02/002.

¹¹ Bodl. MS Lister 3, f. 138.

¹² To table is to board, so Lhwyd would stay at an inn or a friend’s away from home.

lately gone to the same pit in hopes to finde such an other.¹³

Since Faringdon is 15 miles from Oxford, this could tally with Petiver's description of his expedition with Lhwyd, or they may indeed have gone as far as Cirencester and Gloucester, some 30 to 40 miles away. Lhwyd's comments about Faringdon refer to the Faringdon Sponge Gravels, which form sediment that is a deferred deposit. "Until the introduction of tar, the Lower Greensand Sponge Gravels were well established and widely used as pavement gravel... evident from Lhwyd's *Lithophylacii* in which fossils e sabuleto quodam proper Faringoniam [in sandy places around Faringdon] and in sabuleto Coxalense."¹⁴

The gravels and the fossils that they contain resulted from erosion of rocks during the Cretaceous era. In plate 16 of his *Lithophylacii*, Lhwyd indeed portrayed a "pliosaur tooth occurring as a derived Jurassic fossil in the Lower Cretaceous Sponge Gravels of Faringdon, Oxfordshire. 1319 is a crocodile tooth from the same horizon and locality."¹⁵ Lhwyd and Petiver may have recorded one of the first scientific peregrinations that resulted in dinosaur fossils; plate 19 and 20 in the *Lithophylacii* also featured vertebrae of a plesiosaur and ichthyosaur, labelled by Lhwyd as "ichthyospodyli" or fish bones.¹⁶

Lhwyd realised, however, that rich as his findings were, his purse was not, especially to sustain repeated expeditions to attempt a fossil field guide that would cover all of Britain. Although Lhwyd knew such a book would be of "good use," it could not be "done tolerable well under two Summers travailing at least, which (Had I a purse to bear it) I should willingly undertake leaving a Deputy at the Museum."¹⁷ Unfortunately for Lhwyd, a robbery at the Museum committed between 17 and 22 September 1691 whilst he was gone lithoscoping,

¹³ Bodl. MS Lister 36, f. 25.

¹⁴ www.oxfordshiregeologytrust.org.uk/wp-content/uploads/2017/06/The-Faringdon-Sponge-GravelsWTH_ORG.pdf (accessed 20 Sept. 2017).

¹⁵ www.oum.ox.ac.uk/learning/pdfs/lhwyd.pdf (accessed 20 Sept. 2017).

¹⁶ Davidson, "A Tale of Four Lhwyds" (cit. note 1), pp. 126-127.

¹⁷ Bodl. MS Lister 3, f. 138. Lhwyd to Lister, 16 June 1691.

meant his fieldwork became more circumscribed.¹⁸ He began supplementing his specimen collection using paid searchers or “collector’s collectors” to gather fossils for his book, as well as his Deputy curator when he formerly became Keeper of the Ashmolean in 1690. It was not a novel idea. Searchers like Thomas Willisel (bap. 1621, d. 1675?) who worked with naturalist John Ray, and Emanuel Mendes da Costa (1717-1791) were gifted natural philosophers who gathered material for the Royal Society Repository in the early modern period. Lhwyd, however, was not always so fortunate to get conscientious searchers. He wrote to Lister on 26 August 1695:

Smith of Witney whom we formerly employed in Lincolnshire has got a good Collection, but would not part with them at any reasonable rate, so I have dismissed him... These Countrey Fellows I find will sell their best Customers for a halfpenny, so I thought it convenient to teach the bearer who is a man of Discretion and Fidelity.¹⁹

The “bearer” was David Jones who served as Lhwyd’s Servitor and Deputy at the Museum. Lhwyd sent him not only to the chalkpits in Kent to find fossils, but also to retrieve “Crampstones or Glossopetrae he could meet with in Shepey.”²⁰

The Isle of Sheppey, at the mouth of the Thames estuary, is internationally renowned for the quality and diversity of the fossils; the most common are iron pyrite casts of small invertebrates.²¹ The “crampstones” or the serpent tongues (*glossopetrae*) that Lhwyd mentioned were actually carcharodons or shark teeth; thought to be a cure for cramp or a poison detector, they were highly coveted. These fossilised fish and sharks’ teeth, as well as individual vertebra can indeed be found on Sheppey, accumulated on the shore by gentle

¹⁸ For details of the robbery, see Robert T. Gunther, *Early Science in Oxford*. Vol. III, *The Biological Sciences and the Biological Collections* (Oxford: Clarendon Press, 1925), pp. 321-323. See also Lhwyd’s letters to Walter Charleton of 25 and 26 September 1691, BL MS Sloane 3962, ff. 288- 289, 291; Martin Lister to Edward Lhwyd, 26 September 1691, Bodl. MS Ashmole 1816, fols 87-88; Edward Lhwyd to Martin Lister, 15 November 1691, Bodl. MS Lister 36, f. 29.

¹⁹ Bodl. MS Lister 36, f. 128.

²⁰ Bodl. MS Lister 36, f. 128.

²¹ http://www.sheppeyfossils.com/pages/General_background.htm (accessed 20 Sept. 2017).

wave action. Lhwyd's *Lithophylacii* was the first to publish a table of shark teeth from Sheppey, most of them *Otodus obliquus*, although David Jones did bring back a Hexantheid tooth, which was portrayed in Lhwyd's book (number 1276).²² Due to their rarity and desirability, Sir Hans Sloane made several notes about Sheppey fossils in his annotated copy of Lhwyd's *Lithophylacii*, keying them to his own fossils in his vast collection, a practice that he repeatedly used as we will see below.²³ [LT1]

By 1698, Lhwyd himself was able to have an expedition to the Newton Estate of Sir Griffith Rice (1667-1729) in Llandeilo, Carmarthenshire, and Caldey Island off the Pembrokeshire Coast near Tenby. His sketchbook of the expedition included a drawing of trilobite fossils in Carmarthenshire, one of which, *trinucleus*, was later portrayed in his *Lithophylacii* in Table 23 (Fig. 1).²⁴

[Fig. 1 preferably here]

Lhwyd thought trilobites were related to the genus *Buglossus* or common sole, the fossil representing the fish skeleton in its morphology, and quoted Aldrovandi as having “described similar fossils as ichthyomorphous bodies.”²⁵ [LT2]

He also drew a set of basalt columns he saw on Caldey Island, which were also subsequently engraved in his *Lithophylacii* in Table 23; this sketch was accompanied by several pages of drawings of sea lilies or crinoid fossils, Lhwyd noting in this *Lithophylacii*

²² http://www.sheppeyfossils.com/pages/g_b2.htm (accessed 20 Sept. 2017).

²³ Edward Lhwyd, *Lithophylacii Britannici Ichnographia* (London: **ex officina**, 1699). Sloane's copy in the British Library is shelfmark 970.i.1. The notes about Sheppey do not have folio numbers but are tipped into the book.

²⁴ BL Add MS 15067, f. 66. The trilobite is possibly *Cryptolithus [Trinucleus] cf. concentricus*.

²⁵ Joseph E. Portlock, *Report on the Geology of the County of Londonderry, and of Parts of Tyrone and Fermanagh* (Dublin: Andrew Milliken, 1843), p. 234. His remarks about the fossil will be published in the second edition of his work: Edward Lhwyd, *Lithophylacii Britannici Ichnographia editio altera* (Oxford: e typographeo Clarendoniano [Clarendon Press], 1760), pp. 95-101.

that in “Wales, wherever there is lime-stone, are found many varieties of Entrochi.”²⁶ [LT3] Just as his determinations of the origin of the trilobite fossils were guided by morphological similarities, Lhwyd may have juxtaposed his sketches of the basalt columns with crinoid stems in his notebook due to their similar morphology. The morphological similarity of basalt columns to crinoids were a topic of interest in the late seventeenth century when the columns of the Giant’s Causeway in Northern Ireland were “discovered.” Sir Richard Bulkeley (1660-1710) first reported its existence in a letter printed in the *Philosophical Transactions* in 1693, and folklore related that the Irish legendary giant Finn McCool created the causeway as a walkway for Scottish giant Benandonner.²⁷ Bulkeley described the pillars as “perpendicular Cylinders, Hexagones and Pentagons” without joins, which to him appeared to be similar to “Astroites,” or star-shaped crinoid fossils. His comments led the Royal Society to think the Causeway might consist of giant forms of these fossils, and Lister wrote excitedly to Edward Lhwyd confirming this conclusion about the “giant pillars.”²⁸ Bulkeley, however, received his report second-hand, and the following year Sir Thomas Molyneux (1661-1733) corrected his notions in a letter to Lister, describing the ball-and-socket joining of the columns, and discarding any notion of them being crinoidia. Molyneux sent a master draughtsman called Mr Sandys to visit the Causeway, to report his findings, and to bring back mineral samples.²⁹ By such means, Molyneux was able to identify correctly their composition as basalt, a rock far different from the calcareous limestone of crinoid fossils, whether of organic origins or simply “formed stones,” something Lhwyd also did in his notebook, labelling his drawings of the Caldey Island columns as “Basaltes Minimus Striatus.”³⁰

Caldey was also where Lhwyd petitioned the University of Oxford in a letter of 19

²⁶ Edward Lhwyd, *Lithophylacii Britannici Ichnographia altera* (Oxford: e typographeo Clarendoniano [Clarendon Press] 1760), p. 106.

²⁷ Sir Richard Bulkeley, “Part of a Letter from Sir R.B. S.R.S. to Dr. Lister, Concerning the Giants Causway in the County of Antrim in Ireland,” *Philosophical Transactions*, 1693, 17:708-710.

²⁸ Bodl. MS Ashmole 1816, f. 116r.

²⁹ EL/M1/105, f. 105r, Royal Society Library, London. Molyneux wrote the letter to Lister on 25 March 1698.

³⁰ BL Add MS 15067, f. 64.

February 1697/8 to publish his catalogue of fossils, wishing to dedicate the book to Lister. Lhwyd noted, “I am well assured that if the Delegats think fit to print it, he will be sensible of the Favour; and in Regard it contains the Grounds of a new Science in Natural History... and is the Result of many years searches & Observations.”³¹ Unfortunately, Lhwyd was spectacularly unsuccessful in his pleas. Lister, along with Samuel Pepys and Sir Hans Sloane helped Lhwyd bring his *Lithophylacii* to press by subscription, Lister supervising the production of the illustrations and lending his friend copperplates (analysed below) that would be useful. Lister told Lhwyd “Yor Booke is well printed for letter & paper, & cutts, as any ever was in England.”³² As Oxford University Press would not publish Lhwyd’s work due to its expensive illustrations, Lister encouraged his colleagues to subscribe, the cost of the 120 books produced being shared between ten virtuosi and noblemen. These included Lister, Lord Somers, Lord Montagu, the Earl of Dorset, Dr Hans Sloane, Tancred Robinson, chemist and professor Étienne François Geoffroy of Paris, Francis Aston and Isaac Newton. Because of Lister’s efforts, Lhwyd wrote “you have been at a great deal of trouble and expence about the gravings which is a kindness I am troubled I know not how to make any amends for, tho I know your goodness never expected any.”³³ Subsequently, when the book was published in 1699, Lhwyd dedicated his book to Lister, describing him as the “Fundator munificus” of the Ashmolean Museum as well as a great encourager of the study of British fossils.

2. After the *Lithophylacii*: Correspondence and the Use of Lhwyd’s Field Guide in the Development of Museum Collections

³¹ Bodl. MS Ashmole 1816, f. 62.

³² Bodl. MS Ashmole 1816, ff. 128-29. The letter was dated 28 January 1698.

³³ Bodl. MS Lister 36, f. 215r.

In the years following the publication of *Lithophylacii*, Lhwyd maintained a correspondence with James Petiver and Hans Sloane.³⁴ [LT4] Lhwyd evidently saw these two prominent metropolitan collectors as vital sources of specimens, not only for his own collections, but also for those of the Ashmolean Museum. Out of these two correspondents, Sloane was perhaps the most important. Sloane's great wealth, primarily built from his highly successful medical practice and proprietorship of sugar plantations in the West Indies, gave him the financial power to build a vast natural history collection on a global scale.³⁵ Lhwyd corresponded with Sloane from the early 1690s regarding the specimens he published in *Lithophylacii*, and following its publication in 1699, they maintained a close correspondence until Lhwyd's death in 1709. The main theme of this correspondence was the collection and exchange of specimens and books, showing that Sloane and Lhwyd exchanged vast quantities of material in the decade following the publication of *Lithophylacii* — Lhwyd gave Sloane fifty-three echinoids alone, this being only one small part of Sloane's fossil collection.³⁶ This is evidenced in a letter Sloane received from Lhwyd concerning a large number of duplicate specimens, primarily made up of 'formed stones,' which Sloane donated to the Ashmolean Museum in 1701:

If you please to take the Trouble of shewing him [A representative of the Ashmolean] your collection, he can partly satisfy you of what we have but in general you may be well assured anything you please to spare us, will be very acceptable. For tho you should have some of them already; yet yours being (I presume), chiefly of your own collecting, will be more valuable on account of the information you may adde of their Native places, see. Here are already two cabinets of Dr. Plot's, one of Dr. Lister's and

³⁴ See Cyrille Delmer, "Sloane's Fossils: A Historical and Scientific Review of the First Fossil Collection of the British Museum," in *From Books to Bezoars: Sir Hans Sloane and his Collections*, edited by Michael Hunter, Alison Walker, Arthur MacGregor (London: British Library, 2012), pp. 15437-157: 155.

³⁵ James Delbourgo, *Collecting the World: The Life and Curiosity of Hans Sloane* (London: Allen Lane, 2017).

³⁶ NHM, South Kensington General Manuscripts (RBR Shelf 302 & 303), Vol. I, "Manuscript Catalogues of Sir Hans Sloane's Fossil Collection."

one or two of another Persons. And I think it most proper yt yours be also [d]eposited in a Distinct Cabinet, wch though you should not furnish immediately; you may perhaps hereafter be mindfull of, as occasion shall offer. I shall take care to register your Donation according to our usual manner and shall be always glad of any opportunity of approving my self.³⁷

Lhwyd's main incentives for receiving Sloane's duplicate specimens become clear when they are compared with the other collections held by the Ashmolean Museum. Lhwyd's own collection, which he described to Sloane in 1703 as being small "for it consists of little else but formed stones," was primarily collected in Britain. Although Lister had a global shell collection, his fossil specimens were also largely gathered from the north of England when he was a physician in York, and in other areas of Britain via Lhwyd or from men he hired to go "lithoscopying."³⁸ Similarly, Robert Plot's main collection was formed when he toured England to produce his *Natural History of Oxford-Shire* (1677) and *Natural History of Stafford-Shire* (1686).³⁹ In comparison to Lhwyd, Sloane had a vast network of global correspondents at his disposal, who supplied him with specimens such as Lead ore from Naples, Bivalves and echinoids from Switzerland, Spain, the West Indies and Japan, a Mammoth tooth from Siberia, a fossil turtle shell from Turkey and a purse made from a variant of asbestos from North America, which he received from Benjamin Franklin.⁴⁰ Lhwyd

evidently saw Sloane as a potential source from which he could obtain a great variety of

³⁷ Edward Lhwyd to Sir Hans Sloane, 1701, BL MS Sloane 4038, f. 236.

³⁸ See letter from Edward Lhwyd to Martin Lister of 9 August 1689 accompanying a parcel of shells and fossils from the Welsh coast and Oxford quarries, Bodl. MS Lister 35, f. 132. See also Lister's thanks to Lhwyd for "figured stones," on 8 April 1690 on Bodl. MS Ashmole 1816, f. 79, and Lister's instructions to Lhwyd for the "Lithoscope" on 18 October 1693, Bodl. MS Ashmole 1816, ff. 101-102. The Appendix to Book Three Lister's *Historiae Conchyliorum* of figured stones shows a large variety of English and Welsh specimens received from Lhwyd and Woodward; with some from the continent from Joseph Pitton de Tournefort, and a number of specimens collected in York. The Appendix to Book Four features a variety of specimens from Paris, and many large Yorkshire ammonites, such as specimen 1045.

³⁹ Robert Plot, *The Natural History of Oxford-Shire, Being an Essay toward the Natural History of England* (Oxford: Oxford University Press, 1677); Robert Plot, *The Natural History of Stafford-Shire* (Oxford: Oxford University Press, 1686).

⁴⁰ John Thackray, "Mineral and Fossil Collections," in *Sir Hans Sloane: Collector, Scientist, Antiquary, Founding Father of the British Museum*, edited by Arthur MacGregor (London: British Museum Press, 1994), pp. 125-133.

exotic specimens for his own and the Ashmolean's collection, which becomes apparent in a letter he sent to Sloane on February 21, 1703:

I hear you have now at London a quantity of those stones, which have representations of whole fish: it was never my Fortune to meet with anything at all of that kind in the countys I travell'd, unless the Buglossa curla strogosa of ye Lithoph. Brit. [trilobites]... if you suppose there may be anything in my collection tht might be acceptable, be pleased to give some General direction; and as I have any spare time, the drawers shall be looked over & what duplicates occur, sent to you.⁴¹

In addition to the exchange of duplicate specimens between Sloane, Lhwyd and the Ashmolean, Sloane received a number of specimens from Lhwyd for the purpose of identification. This is apparent in the case of a stone Lhwyd found on his tour to Ireland which he sent to Sloane in 1703/4: "This stone is one of the most elegant and singular curiosities I discovered in Ireland; and is no where figured or described that I know of. If you think on't, I should be very glad to know your thoughts of the origin of it."⁴² This specimen was quickly accessioned into Sloane's collection. In his catalogue entry, Sloane provided a detailed account of Lhwyd's correspondence on the discovery of this specimen in Ireland, including a brief description of the topographical features of the region in question.⁴³

The fact that Lhwyd asked Sloane for his opinions on the origins of fossils is very significant. Lister at first believed that fossils were inorganic, commenting in 1671 "I am apt to think that there is no such matter as Petrifying of Shells in the business... but that these cockle like stones ever were, as they are at present, *Lapides sui generis*, and never any part of an Animal."⁴⁴ [LT5] After claiming fossils were mere "formed stones," in his later *Historiae*

⁴¹ Edward Lhwyd to Sir Hans Sloane, 1703, BL MS Sloane 3039, f. 248.

⁴² Edward Lhwyd to Hans Sloane, 1703/4, BL MS Sloane 4039, f. 255.

⁴³ NHM (cit. note 36), f. 208.

⁴⁴ Martin Lister, "A Letter of Mr. Martin Lister, Written at York August 25 1671, Confirming the Observation in No 74. about Musk Scented Insects; Adding Some Notes upon D. Swammerdam's Book of Insects, and on That of M. Steno Concerning Petrify'd Shell," *Philosophical Transactions*, 1671, 6: 2281-2284, p. 2282.

Animalium (1678), Lister noted that he did not completely “disregard the fact that these are much like living things of which nature has wearied. Certainly I have thought about these possibilities.”⁴⁵ Lister followed this comment by stating that he would “stop these ruminations in the presence of the reader; they [the specimens] may speak for themselves. If yet it is able to be judged what these earthly stones are to be, I will consider it, nor will I make rash judgments.”⁴⁶ Sloane was less equivocal and consistently believed they were the remains of living things from deep antiquity.⁴⁷ This is apparent from Sloane’s publications and the manner in which he arranged his collection, although he admitted when discussing the discovery of fossils in Barbados, that “it is pretty strange that sometimes at great depths in the Bowles of the Earth, these Substances that have belong’d to real Shell-Fish should be found. They are common in most counties of England.”⁴⁸ Sloane acquired a number of fossils in the West Indies, some of which he published as figures in *A Voyage to Jamaica* (1725), such as an example of “the long prickled Sea Egg”, an image Sloane cited in his catalogue of fossil echinoids.⁴⁹

Sloane’s belief that fossils, or figured stones, were once living things further manifests itself in the manner in which he arranged the catalogue for his paleontological collections.⁵⁰ These, especially those concerning invertebrates, have the same broad morphological divisions as those used in the catalogues of shells, for instance, in his catalogues of shells and fossils there is a separate section devoted to echinoids, which are ordered according to their physical resemblances. This classification, which relied on the roundness of the specimen,

⁴⁵ “Non autem ignoro, hac rerum viventium imagines multorum ingenia fatigâsse. At eorum sententiae non utique; examinandas putavi...” Martin Lister, Preface to section four of *Historiae Animalium Angliae tres tractatus* (London: John Martyn, 1678), p. 1.

⁴⁶ “Sed ipsas res coram Lectoribus sisto; ipsae loquantur. Si tamen eorum sententiae qui hos lapides terrigenos. esse judicârunt, favere videar, non temerè id facio,” *ibid.*

⁴⁷ Delmer, “Sloane’s Fossils” (cit. note 34), p. 155.

⁴⁸ Hans Sloane, *A Voyage to the Islands Madera, Barbados, Nieves, S. Christophers and Jamaica, with the Natural History of the Herbs and Trees, Four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c. of the Last of those Islands*, 2 vols. (London, 1707-1725), Vol I, p. lxiv.

⁴⁹ *Ibid.*, Vol. II, table 243.

⁵⁰ Thackray, “Mineral and Fossil Collections” (cit. note 40), p. 130.

started with those he called a “Chalk egg” and ended with those that were “very flat and narrow,” somewhat similar to a Sand Dollar (*Clypeasteroidea*).⁵¹ Despite their differences of opinion regarding the formation of fossils, Sloane’s reliance on morphological similarities was similar to Lhwyd’s means of classified fossils as we saw with the trilobites and the pairing of basalt columns and crinoids. Sloane and Lhwyd evidently had a good relationship, probably helped by the amounts of duplicate books and natural history specimens Sloane consistently donated to the Ashmolean Museum. Lhwyd held Sloane’s donations in high esteem. In 1703 he wrote to Sloane, describing how “Your present to the museum shall lye in the window by Mr. Ashmole’s Picture; & your former letter with it.”⁵² This was one of the most prominent positions in the old Ashmolean Museum, underneath the portrait its founder, Elias Ashmole (1617-1692), a main centrepiece which was clearly visible to all who entered the building.

However, Sloane not only received duplicates in exchange for his contributions to Lhwyd’s and the Ashmolean’s collections. Lhwyd sent Sloane and Petiver specimens which he used in *Lithophylacii* in exchange for more exotic material, recognising that these naturalists considered this sort of specimen to be particularly valuable because descriptions and images of them had been published. The publication of descriptions and images of these objects in Lhwyd’s *Lithophylacii* effectively made them the basis for the identification of the same species when it was found by other naturalists who were using this field guide — as a small book, it was easy to take on a fieldwork expedition as it could be stowed inside a jacket pocket or saddle bag. The inclusion of these specimens made Sloane’s and Petiver’s collections far more valuable. They were now seen as a central reference points for naturalists that held the original specimens which were used as a means for the identification of all the new examples of that particular species.

⁵¹ NHM (cit. note 36).

⁵² Edward Lhwyd to Sir Hans Sloane, 1703, BL MS Sloane 4039, f. 222.

3 Surviving Specimens

A typical example of the specimens Lhwyd sent to Sloane and Petiver that had been published in *Lithophylacti* were two echinoids, which Lhwyd named *Echinires galeatus vulgaris* (*Echinocorys scutatus*) and *Echinites cordatus vulgaris* (*Micraster coranguinum*).⁵³ Remarkably, these two specimens survive in Sloane's collection, held by the Natural History Museum, London, escaping the fate of many of Sloane's mineralogical specimens which were used as hard core in the foundations of the new buildings of the British Museum during the early nineteenth century. When a parliamentary select committee enquired into what had happened to the Sloane natural history collection in 1836, Charles Koenig, keeper of the department of natural curiosities, confessed that many objects "were in an advanced state of decomposition, and they were buried or committed to the flames one after another."⁵⁴ However, these two fossilised sea urchins managed to survive the purges of the nineteenth century (Fig. 2).

[Figure 2 preferably here]

These echinoids provide an essential insight into the processes behind the production of a book such as Lhwyd's *Lithophylactii*, and why Sloane considered these objects to be important additions to his collection. The specimen *Echinites cordatus vulgaris* was collected by Lhwyd from a chalk pit near Gravesend, Kent, and depicted as figure 964 in table 12 in *Lithophylactii*.⁵⁵ These chalk deposits, which occur frequently to the south of the river Thames, are from the upper cretaceous chalk group and were mined in this area for centuries,

⁵³ Consuelo Sendino, "The Hans Sloane Fossil Collection at the Natural History Museum, London," *Deposits Magazine*, 2016, 47:13-17, p. 16.

⁵⁴ *Report from the Select Committee on the Condition, Management and Affairs of the British Museum; Together with the Minutes of Evidence, Appendix and Index*, Vol. XXXIII (London: House of Commons, 1836), p. 197.

⁵⁵ Lhwyd, *Lithophylactii* (cit. note 23), p. 47.

particularly after the foundation of the naval arsenal in Woolwich in the sixteenth century, when these pits were used to obtain lime for smelting iron.⁵⁶ The main point of depicting this specimen in Lhwyd's work was to convey its specific physical characteristics, which were difficult to describe in the printed text. For instance, in the case of *Echinites cordatus vulgaris*, the heart-shape of the specimen and its lack of symmetry, due to a small impression towards the point of the heart on the right hand side, were considered to be features which could prove essential for the identification of new specimens of this particular species.⁵⁷

In order to produce images in this work, several processes had to be carried out to successfully transfer a three dimensional physical object into a copperplate engraving. Initially, manuscript images of these specimens were produced, possibly by Lhwyd himself, as evidenced by the pen and ink wash drawings of fossils which appear in one of his note books.⁵⁸ These images were then cut out of the note book and rearranged, so they could fit on the space allocated for the copperplate. This is shown by the images in Lhwyd's notebook, some of which have been cut out and moved around, in some cases causing significant damage to illustrations on previous pages.⁵⁹

The shadows cast by these two fossils in the engraved images were designed to give an impression of their three-dimensionality, essential features for conveying the size of this specimen to users of this book. The shadows, which are cast on a flat plain, similar to those in the surviving manuscript drawings, are rendered in the copper plate images with cross-hatched lines of varying density which depends on the concentration of light or shade.⁶⁰ The differences in the direction of shading on the plain next to these fossils shows that they were

⁵⁶ Katherine R. Royse, Mike de Freitas, William G. Burgess, John Cosgrove, Richard C. Ghail, Phil Gibbard, Chris King, Ursula Lawrence, Rory N. Mortimore, Hugh Owen, Jackie Skipper, "Geology of London, UK," *Proceedings of the Geologists' Association*, 2012, 123:22-45, p. 24.

⁵⁷ Lorraine Daston, "Type Specimens and Scientific Memory," *Critical Inquiry*, 2004, 31:153-182, p.181.

⁵⁸ BL Add MS 15065, Edward Lhwyd, "LIST Of Shells, arranged in genera and species, in Latin; in the handwriting of Edward Lhwyd, of Jesus College, Oxford; with a few drawn figures," f. 34-34 verso.

⁵⁹ *Ibid.*

⁶⁰ Sachiko Kusakawa, "Drawings of Fossils by Robert Hooke and Richard Waller," *Notes and Records of the Royal Society*, 2013, 67:123-138, p. 130.

drawn separately, probably on different pieces of paper, which were then cut out, re-arranged, and glued onto a sheet of paper which was the same size as one of the copperplates, therefore forming the compilation of specimens seen on the copperplate in *Lithophylacii*. Similar to the shells illustrated for Martin Lister's *Historiae Conchyliorum*, it is ~~likely in some cases~~probable that the periphery of each specimen was traced directly onto the page.⁶¹ These assemblages of images were then engraved onto the copper plates by the Dutch engraver Michael Burghers (1647/8-1727), who had previously engraved the works of Lhwyd's predecessor, Robert Plot.⁶² This was an expensive process, not least because the plates were often made from pure copper, ensuring that they were easier to engrave and correct at a later date.⁶³ These copper plate images were essential for distributing Lhwyd's collection on a grand scale; especially as copies of the *Lithophylacii* were probably sold in the foyer of the Ashmolean Museum to visitors, in close proximity to the collection it represented. The distribution of images of objects in collections through the medium of field guides such as *Lithophylacii* were essential for creating portable collections of otherwise immobile museum specimens. This ensured that other naturalists could carry images and descriptions of the Ashmolean's fossil collection with them in the field in order to successfully identify newly found specimens (Fig. 3).⁶⁴

[Figure 3 preferably here]

4. The Cataloguing Power of Hans Sloane

⁶¹ Anna M. Roos, *Martin Lister and his Remarkable Daughters: The Art of Science in the Seventeenth Century* (Oxford: Bodleian Library Press, forthcoming October 2018).

⁶² These were the *Natural History of Oxford Shire* (1677) and the *Natural History of Stafford Shire* (1686).

⁶³ Anna M. Roos, "The Art of Science: A 'Rediscovery' of the Lister Copperplates," *Notes and Records of the Royal Society*, 2012, 66:19-40, pp. 29-30.

⁶⁴ Martin J.S. Rudwick, "Picturing Nature in the Age of Enlightenment," *Proceedings of the American Philosophical Society*, 2005, 149:279-303, pp. 283-284.

The publication of Lhwyd's specimens in the form of copper plate engravings was of great importance to Sloane. This is evidenced in the original entries for these objects in his catalogue of fossils. For instance, in the case of both of these examples of fossilised sea urchins, Sloane has used the name given by Lhwyd in *Lithophylacii* and referenced the page and specimen numbers next to which the description can be found, and the relevant figure in the copper plate image.⁶⁵ In the case of the species Lhwyd named *Echinites cordatus vulgaris*, Sloane has given this specimen catalogue number "263," a number he pasted onto the specimen itself, and added a description of where the specimen was found along with the precise references to Lhwyd's *Lithophylacii* to his bound manuscript catalogue.⁶⁶ This number was carefully pasted onto the verso of the specimen so as to ensure that the features on the front of the specimen remained visible, ensuring that these could be compared with that depicted in the copperplate image in *Lithophylacii*. Sloane noted that this specimen was "From Kent from the chalk pitts," drawing directly on Lhwyd's description.⁶⁷ This practice of record-keeping is again apparent in the case of the species Lhwyd gave the name *Echinites galeatus vulgaris*, a specimen Sloane classified towards the beginning of his catalogue as a result of its round shape, ascribing it the specimen number '138.'⁶⁸ Again, Sloane copied out Lhwyd's name, description and page references to *Lithophylacii*, along with a description of its original locality. These bound catalogues are typical of those used by late seventeenth and early eighteenth-century naturalists to order their collections.⁶⁹ The verso of the previous page was intentionally left blank, so new acquisitions could be slotted into Sloane's systematic arrangement, maintaining the original numbering system. The objects in the collection were then broadly ordered according to the sequence given in the catalogue, as evidenced by one

⁶⁵ NHM (cit. note 36), Echini, ff. 157-216.

⁶⁶ Ibid., f. 180.

⁶⁷ Ibid., f. 180; Lhwyd, *Lithophylacii* (cit. note 23), p. 47.

⁶⁸ NHM (cit. note 36), f. 168.

⁶⁹ Elizabeth Yale, *Sociable Knowledge: Natural History and the Nation in Early Modern Britain* (Philadelphia, University of Pennsylvania Press, 2016), pp. 128-129.

contemporary observer's comments on how Sloane's zoological specimens were "dispos'd in the same succession of numbers as they were in at Bloomsbury," following his move to Chelsea in 1742.⁷⁰

In the catalogue entries for both of these echinoids, Sloane has given the descriptions from *Lithophylacii* and referred to the specific specimen number in Lhwyd's work. In Sloane's copy of this work, a considerable amount of marginal annotation appears next to the descriptions and copper plate images of these specific specimens. This is in stark contrast to the other un-annotated entries on these pages, which concern fossils that were not acquired by Sloane or Petiver. The first part of each annotation cross references the description with the copper plate image in *Lithophylacii*, in this case, "T.12," which stands for "Table 12." The second tier of annotation, "MP. 127," further cross references this description with another work in Sloane's library, that being a copy of James Petiver's *Musei Petiveriani* (1703), in which Petiver describes two examples of the same species of these echinoids.⁷¹ In Sloane's copy of *Musei Petiveriani*, which originated in Petiver's collection and came to Sloane in 1718, annotated crosses have been inked in next to the relevant entries.⁷² These annotations are probably by Petiver, who, in a similar fashion to Sloane, consistently made efforts to cross reference published descriptions with physical objects in his collection. For instance, in Petiver's copy of Georgius Everhardus Rumphius's *D'Amboinsche Raritkamer* (1705), Petiver has added location codes for specific specimens in his collection to the

⁷⁰ Quoted in Delbourgo, *Collecting the World* (cit. note 35), p. 259.

⁷¹ Lhwyd, *Lithophylacii* (cit. note 23), pp. 46-47. In a forthcoming article, Arnold Hunt also discusses other elements of Petiver's organisational system. See 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*, edited by Vera Keller, Anna M. Roos, Elizabeth Yale (Leiden: Brill, forthcoming 2018).

⁷² James Petiver, *Musei Petiveriani centuria prima(-decima) rariora naturae continens, viz. animalia, fossilia, plantas, ex variis mundi plagis advecta, ordine digesta* (London: S. Smith and B. Walford, 1695-1703), p. 127. Petiver's annotated copy is in the British Library, shelf mark: 968.b.13.(1.). In the case of the quadrupeds described by Petiver, referencing codes which link to Sloane's manuscript catalogues have been added to the margins next to each entry in this particular copy of Petiver's *Musei Petiveriani*.

margins next to the relevant printed description.⁷³ In *Musei Petiveriani*, Petiver's cross indicates that he has an example of the specimen described in the printed text. This specimen can be found in category (probably cabinet) five, in which he placed "Fossilia, viz. Echinites. Petrified Sea-Urchins," giving it the code "A. 127," linking it to his catalogue.⁷⁴ The same code has been added to the relevant figures in Sloane's copy of Lhwyd's *Lithophylacii*, triangulating the images and printed descriptions with *Musei Petiveriani*.⁷⁵ The final section of annotation; "14," probably relates to another aspect of the collection's physical arrangement, although the lack of evidence relating to how Sloane and Petiver arranged their collections during the first decade of the eighteenth century makes it very difficult to ascertain precisely what this number might relate to. However, if the arrangement of Sloane's collection by the 1730s is anything to go by, these are probably early references to a specific drawer.⁷⁶ [LT7] By the early 1740s, these cabinets lined Sloane's 110ft long gallery in Chelsea Manor and were interspersed with books which related to the specimens ~~in the cabinets~~they contained, showing the close spatial arrangement between printed texts and physical objects in Sloane's collection.⁷⁷ Sloane continued to value these additional references to Petiver's work, comparing the shape of Lhwyd's and Petiver's specimens and continually keeping this printed book, which served as a vital reference point for the identification of these objects, in close proximity to the specimens themselves.

Sloane probably listed Petiver's specimens in his catalogue after that which was figured by Lhwyd, showing how he placed objects which had previously been published at the top of his ranking for different specimens of the same species. Sloane gave the duplicate

⁷³ Petiver, *Musei Petiveriani* (cit. note 72); *D'Amboinsche Rariteitkamer, behelzende eene Beschryvinge van... Schaalvisschen... die men in d'Amboinsche Zee vierdt daar beneven zommige mineraalen, etc.* (Amsterdam: 1705), NHM SB ff R (Zoology Library).

⁷⁴ Petiver, *Musei Petiveriani* (cit. note 72), p. 20.

⁷⁵ Lhwyd, *Lithophylacii* (cit. note 23), p. 47; Petiver, *Musei Petiveriani* (cit. note 72), p. 20.

⁷⁶ Marjorie Caygill, "Sloane's Catalogues and the Arrangement of his Collections," in *From Books to Bezoars* (cit. note 34), pp. 137-157: 124-125.

⁷⁷ Edwin D. Rose, "Natural History Collections and the Book: Hans Sloane's *A Voyage to Jamaica (1707-25)* and his Jamaican Plants," *Journal of the History of Collections*, 2018, 30:15-33.

specimens somewhat simplistic cataloguing descriptions, such as “264. Another lesser and broken,” which he described as being found in Chiswick, and “265. Another lesser.”⁷⁸ Even though these were there same species as the specimen figured by Lhwyd, and therefore shared its morphological characteristics, Sloane preferred to list the specimen which had been described and figured in *Lithophylacii* first, and then list the duplicates, showing how a specimen that had previously been published was ranked in Sloane’s morphological arrangement, providing the basis for the descriptions of all specimens of the same species (Fig. 4).

[Fig. 4 preferably here]

5. From Chelsea to the British Museum

By 1739, Sloane was seventy-nine years old and was beginning to contemplate the future of his collection seriously. Most of his contemporaries, such as Lhwyd, Ray, Lister and Petiver had died decades ago, many of whose collections had been amalgamated into Sloane’s overarching collection of collections.⁷⁹ In his will, dated 9 October, 1739, Sloane wished for the collection to be sold for £20,000, an offer that was initially to be placed before the King, George II.⁸⁰ The construction of rigorous catalogues for the collection during the 1730s and 1740s are evidence that Sloane wished for the collection to remain as a single unit, its potential sale being treated as a final resort.⁸¹ From the late 1720s, Sloane had employed a number of assistants to manage his collection, the last being James Empson (*d.* 1765), who served as Sloane’s curator following his move to Chelsea in 1742. By this time, Sloane seems

⁷⁸ NHM (cit. note 36), f. 180.

⁷⁹ Marjorie Swann, *Curiosities and Texts: The Culture of Collecting in Early Modern England* (Philadelphia: University of Pennsylvania Press, 2010), p. 195.

⁸⁰ Rose, “Natural History Collections” (cit. note 77), pp. 19-20; Delbourgo, *Collecting the World* (cit. note 35), p. 308.

⁸¹ Rose, “Natural History Collections” (cit. note 77), p. 20.

to have given over much of the management of the collection to Empson, as evidenced by the final page in Sloane's catalogue of echinoids, on which Sloane's writing is abruptly replaced by Empson's far neater hand.

On 16 January, 1753 Sir Hans Sloane died at his home at Chelsea aged 92. Shortly after, the executors of Sloane's will offered the collection to King George II, who, due to its formidable price, put the matter before parliament. The British Parliament successfully raised the money to purchase the collection through a lottery; following which those named by Sloane as trustees were formally appointed and held a meeting in Chelsea Manor. These numbered 63 in total and included some of the most prominent names in London Society, such as the Earl of Macclesfield, President of the Royal Society; Sloane's grandson, Lord Cadogan; John Heathcote, a director of the East India Company; and James Empson, Sloane's final curator.⁸² Some of the Trustees were more enthusiastic about the collection than others. For instance, Horace Walpole (1717-1797) famously remarked:

You will scarce believe how I employ my time; chiefly at present in the guardianship of embryos and cockleshells. Sir Hans Sloane is dead and he has made me one of the trustees of his museum, which is to be offered for twenty thousand pounds to the king... he valued it at fourscore thousand; and so would anybody who loves hippopotamuses, sharks with one ear, and spiders as big as Geese!⁸³

In addition to the funds needed to purchase the collection, the lottery organised by Parliament made enough money to purchase a new museum building. This was Montague House, Bloomsbury, a late seventeenth century French-style manor house, to which Sloane's collection was moved in 1756.

Following the move of Sloane's collection from Chelsea to Bloomsbury, the fossils were placed in cabinets in a large room in the corner of Montague House on the second state

⁸² Delbourgo, *Collecting the World* (cit. note 35), p. 312.

⁸³ *The Letters of Horace Walpole, Earl of Orford: Including numerous letters new first published from the original manuscripts*, vol. II (Philadelphia: Lea and Blanchard, 1842), p. 156.

story overlooking the gardens.⁸⁴ The cabinets were located around the sides of the room and some of the larger specimens, such as Sloane's column of basalt from the Giant's Causeway, in his native province of Ulster, were placed in the ground floor lobby due to concerns that they might impact upon the structural integrity of the building.⁸⁵ [LT8] In a long report to the Trustees of the British Museum, Empson commented that Sloane's fossils "are so numerous and so great a variety" that they would not fit in the room allocated for them, several of which had to be placed in an anti-chamber.⁸⁶ This was a substantial rearrangement of Sloane's fossil collection, which were placed in new cabinets designed to fit the rooms at Montague House.⁸⁷ This is evidenced by the new location codes annotated in red ink next to each entry in the catalogue. For instance, the specimen Lhwyd and Sloane ascribed the name *Echinites cordatus vulgaris* was ascribed the cabinet location code '21.y' (Fig. 4).⁸⁸

This was how Daniel Solander found Sloane's collection when he was officially appointed to assist Empson in 1763. Solander had been employed by the Trustees of the British Museum to provide a Linnaean catalogue for the collection, as evidenced by his report which he submitted to the Trustees in September 1764:

D. Solander begs leave to report, that he has made a systematical catalogue of the greatest part of the animals viz... he has likewise begun with the figured Fossils in the Tables in the fossil room, that he has allways given particular attention to, and taken compleat Descriptions of; every thing that has been new and not before properly known, whereof he has found a great number'.⁸⁹

⁸⁴ Rose, "Natural History Collections" (cit. note 77), p. 18.

⁸⁵ Marjorie Caygill, "From Private Collection to Public Museum: The Sloane Collection at Chelsea and the British Museum at Montague House," in *Enlightening the British: Knowledge, Discovery and the Museum in the Eighteenth Century*, edited by Robert G.W. Anderson, Marjorie L. Caygill, Arthur G. MacGregor, Luke Syson (London: British Museum Press, 2003), pp. 18-25+37-45: 20.

⁸⁶ British Museum, Original Papers, "Proposal of a Plan, 1756," f. 43.

⁸⁷ Rose, "Natural History Collections" (cit. note 77), p. 19.

⁸⁸ NHM (cit. note 36), f. 180; Caygill, "From Private Collection to Public Museum" (cit. note 85), p. 127.

⁸⁹ BL, Add MS 45, 874, "Reports and Diary of Occurrences in the Nat. Hist. Department by Dr. Solander. Sept 1764 to Feb. 12th, 1768," ff. 2-2v.

The catalogue Solander produced ~~for the collection~~ took the form of his ‘Manuscript Slip Catalogue,’ which he ordered according to the system of classification for fossils proposed by Linnaeus in *Systema Naturae* (1735).⁹⁰ This ~~took the form of~~ was compiled from a series of paper slips, somewhat similar to index cards, of a size of 4”×6” (10.16cm×15.24cm) which he stored inside a series of Solander boxes.⁹¹ Unfortunately, the slips Solander used for Sloane’s fossil collection do not survive, possibly because the Linnaean system of classification for fossils was quickly eclipsed by rival systems during the late eighteenth century. However, if Solander’s surviving slips are anything to go by, which refer to the zoological and botanical sections of Sloane’s natural history collection, the slips for Sloane’s collection of fossils and minerals were probably grouped into separate Solander boxes which reflected each Linnaean class of the mineral kingdom, these being *Petrae* (rocks), *Minerae* (minerals) and *Fossilia* (fossils, or figured stones).⁹² At the top of each slip, Solander recorded the binomial name for each species, which Linnaeus had first used consistently in the 1753 edition of *Species Plantarum* and the 1758 edition of *Systema Naturae*, underneath which he added a brief description, often basing this directly on those published by Linnaeus himself.⁹³ These slips could then be ordered according to the Linnaean system and rearranged to reflect taxonomic changes or the addition of new species to the British Museum’s collection. In order to link these specimens to the slips, Solander added labels on which he wrote binomial determinations to many of the specimens in Sloane’s collection, therefore creating a Linnaean catalogue which directly related to the objects themselves. Some of these descriptions of the

⁹⁰ For more on the changes Solander made to the collections of the British Museum, see Edwin D. Rose, “Specimens, Slips and Systems: Daniel Solander and the Classification of Nature at the World’s First Public Museum, 1753-1768,” *The British Journal for the History of Science*, 2018, 51/2:205-237.

⁹¹ *Ibid.*, p. 22; Isabelle Charmantier, “Notebooks, Files and Slips: Carl Linnaeus and his Disciples at Work,” in *Linnaeus, Natural History and the Circulation of Knowledge*, edited by Hanna Hodacs, Kenneth Nyberg, Stéphane van Damme (Oxford: Voltaire Foundation, 2018), pp. 25-56.

⁹² See Rose, “Daniel Solander” (cit. note 90); Martin Guntau, “The Natural History of the Earth,” in *Cultures of Natural History*, edited by Nick Jardine, Emma Spary, James Secord (Cambridge: Cambridge University Press, 1996), pp. 211-245: 212.

⁹³ Isabelle Charmantier, Staffan Müller-Wille, “Carl Linnaeus’s Botanical Paper Slips (1767-1773),” *Intellectual History Review*, 2014, 24/215-238, p. 229; Rose, “Daniel Solander” (cit. note 90), pp. 23-28.

Museum's fossil collection were later used by Solander in the textual component for Gustavus Brander's (1720-1787) *Fossilia Hantoniensis collecta, et in Musæo Britannico deposita*, in which many of the fossils collected in Hampshire from Sloane's collection were depicted.⁹⁴ However, Solander was historically sensitive towards Sloane's cataloguing system, ensuring that this continued to function alongside his new labels and 'Manuscript Slip Catalogue,' essentially creating a system which allowed naturalists who used the Linnaean system and those who did not to access the British Museum's collection — responding to the new institution's distinctly 'public' remit, essentially allowing any active member of the Republic of Letters to access the collection.⁹⁵

6. Afterlives of the Copperplates of the *Lithophylacii*

Just as Sloane's collection of fossils had several afterlives and were repurposed for the new British Museum, so did the copperplates for the *Lithophylacii*. As Lister had arranged for the engraving of Lhwyd's copperplates, it seems they came into his possession; sometimes old copperplates were repurposed to cut down on costs. In 1712, Lister bequeathed the copperplates for his *Historiae Conchyliorum* to the University of Oxford, and the Bodleian Library still has in its possession both sets of Lister and Lhwyd plates for the *Lithophylacii*.

The Lhwyd copperplates are silent witnesses to the development of the study of fossils at the Ashmolean Museum, including the activities of some of Lhwyd's deputies, such as Alban Thomas (1686-1771). One year before Lhwyd died in 1709, Alban Thomas was made librarian of the Ashmolean Museum whilst still a student at Jesus College, Oxford, and here he evinced a pronounced interest in fossil collecting. In 1708, he published a four-page notice in the *Philosophical Transactions* to advertise Lhwyd's book and to deal in mineral specimens. Using John Ray's physico-theological discourses, Lister's work on mollusc

⁹⁴ Gustavus Brander, *Fossilia Hantoniensia collecta, et in Musæo Britannico Deposita* (London: Private Press, 1766).

⁹⁵ Rose, "Daniel Solander" (cit. note 90), p. 12.

fossils, Robert Plot's natural histories of Oxfordshire and Staffordshire, as well as the work of naturalist John Woodward and articles in the *Philosophical Transactions*, Thomas offered fossil and mineral collections for sale. "This may well rank Alban Thomas as the earliest known dealer in mineral specimens."⁹⁶[LT9] The collections were named according to Lhwyd's *Lithophylacii* and identified with their locality.⁹⁷ The list was dominated by fossils but also included fluorite, quartz, selenite and talc; the collections were priced at one guinea. During his tenure at the Ashmolean, Thomas also had access to the original plates for Lhwyd's work. On the back of the plate of table 10 of fossilised molluscs in the *Lithophylacii*, he signed his name "Alban Thomas sculpsit" and engraved a series of illustrations of mineral crystals with figure legends, possibly in connection with his advertised trade in minerals. Thomas later served briefly as Assistant secretary to the Royal Society, and when he returned to Wales, he married Margaret Jones, daughter of John Jones of Tyglyn and sister of the High Sheriff of Cardiganshire, who was related to Alban Thomas's former employer at the Ashmolean Museum, Lhwyd.⁹⁸

Fifty years later, William Huddesford, the Keeper of the Ashmolean, was also interested in the *Lithophylacii*, and he decided to do what he described as an "editio altera" using the original copperplates. As for Huddesford, he was described as the only "eighteenth-century Keeper known to be active in his office," and he began his post when the "museum was in decline, and immediately set to work to re-form the geological collections which were in disarray and to lay the foundations of new collections;" Huddesford also searched out new manuscript collections of past donors to the Ashmolean, such as those of Lister and Lhwyd.⁹⁹

⁹⁶ [Wendell E. Wilson](http://www.minrec.org/labels.asp?colid=1066), "Alban Thomas," *Mineralogical Record Biographical Archive*, 2018, available at <http://www.minrec.org/labels.asp?colid=1066> (accessed 18 March 2018).

⁹⁷ Alban Thomas, "Advertisement," *Philosophical Transactions of the Royal Society*, 1708, 26/314:77-80, p. 80.

⁹⁸ [Wilson](#), "Alban Thomas" (cit. note 96).

⁹⁹ Bryn Roberts, "Memoirs of Edward Lhwyd, Antiquary and Nicholas Owen's British Remains," *National Library of Wales Journal*, 1975, 19/1:67-86, on p. 74.

In doing so, Huddesford wished to repair the reputation of the Museum, so “it did not appear the nasty confused heap of trifles it had been invidiously represented to be.”¹⁰⁰

The task was not an easy one. Huddesford, in a letter of 30 November 1757 to conchologist and Royal Society keeper Emanuel Mendes da Costa, complained he could not find “any of the manuscript sheets” of the *Lithophylacii* “in the Museum,” and asked Da Costa for some letters of Lhwyd’s that he had in his possession.¹⁰¹ Like Huddesford did for the Ashmolean, Da Costa worked tirelessly to restore the Royal Society Museum or Repository, which was in a parlous state after Francis Haukesbee’s long tenure as secretary, so Da Costa was a sympathetic ear. Huddesford also realised that Lhwyd’s original text had contained newly coined terms for species, which eighteenth-century readers found incomprehensible, and it was in some places in an unfinished state. He thus wished to reorganise the work taxonomically, setting aside several older and fresh prints of the *Lithophylacii*; opening one of the boxes of Lhwyd ephemera that he set aside and that remain in the Bodleian Library revealed a label “belonging to Mr Huddesford.” Huddesford realised that Lhwyd had great trouble over the text, resulting in many mistakes. His suppositions were borne out by the initial composition of the *Lithophylacii*, “During one of Lhwyd’s extended visits to Wales, the text had in fact been seen through the press in London by Tancred Robinson, who clearly found it a frustrating exercise.”¹⁰² Robinson commented: “Notwithstanding all possible care,” the Compositors will commit many gross Mistakes, and will not correct half the Errata made on the Sides. They are an ungovernable race of men; however it is as correct as most Books of the kind.”¹⁰³ Huddesford confirmed Robinson’s complaints in his letter to Da Costa about Lhwyd’s work:

¹⁰⁰ “Letter from Huddesford to Emanuel Mendez Da Costa, 30 November 1757,” in *Illustrations of the Literary History of the Eighteenth Century*, Vol. IV, edited by John Nichols (London: Printed for the author, by John Nichols and Son, 1822), p. 456.

¹⁰¹ Huddesford to Mendes Da Costa, 30 November 1757, in *ibid.*

¹⁰² MacGregor, “Huddesford” (cit. note 2), p. 59.

¹⁰³ Bodl. MS Eng. hist. c. 11, f. 89. The letter was sent 23 August 1698.

... [the text] is in some places obscure and difficult to the greatest proficient in this study. The descriptions are not distinct, the new coined terms, &c. render it very difficult to be understood. As I found there great impediments to my progress in the undertaking, I concluded they must be so to other young Readers, for whose service I also intended the second Edition; but though I was sensible how much it wanted it, I was diffident of correction. Mr Lhwyd's knowledge I dreaded to question – and of his carelessness I had no suspicion; but I am now sensible that he was sometimes deficient in the former, and very often guilty of the latter.¹⁰⁴

Although Da Costa also “had a quantity of Lhwyd's original papers,” (two portfolios of his correspondence) which he put at Huddesford's disposal, Lhwyd's original fossil specimens were “plundered” and “much damaged by the confusion in which they lay.”¹⁰⁵ Huddesford took advice from antiquaries such Smart Lethieullier (1701-1760) and William Frankcombe (b. 1734) about how to preserve Lhwyd's collections through disposal in the several cabinets.¹⁰⁶ Frankcombe described to Huddesford a letter of Lhwyd's to Lister concerning figured stones which appeared in the *Philosophical Transactions* (no. 243); Francombe thought that the fossils would be in the Museum, advising Huddesford that they should be gathered together and placed “in the End of some drawer or another in his Lithophylacium.”¹⁰⁷ Huddesford was clearly reorganising specimens at the Ashmolean, the

¹⁰⁴ Huddesford to Da Costa, 25 July 1758, in *Illustrations* (cit. note 100), pp. 459-460.

¹⁰⁵ Da Costa to Huddesford, 25 July 1758, and Huddesford to Da Costa, 27 October 1758, in *ibid.*, pp. 457, 459 and 464. In his *editio altera*, Huddesford appended a number of these letters to and from Lhwyd, acknowledging Da Costa's ownership (p. 114).

¹⁰⁶ Lethieullier to Huddesford, 12 March 1756, Bodl. MS Ashmole 1822, ff. 13-14. Huddesford would include a preferatory letter of thanks to Leithiellier in the Preface of his 1760 edition of the *Lithophylacii*.

¹⁰⁷ Francombe to Huddesford, MS Ashmole 1822, f. 9r.

wrapping of Francombe's letter to him featuring a list in his hand of different types of fossils such as "Astroites, Vermiculi, Dentalia, Belemites, Nautili, Ammoniae, Trochi..."¹⁰⁸

In his *editio altera* of Lhwyd's work, Huddesford thus attempted to correct some omissions. For instance, Lhwyd claimed he had been given *buccina* and *pecten* shells specimens *et cretaceis Richmondius*. Da Costa pointed out to Huddesford that this was an erroneous observation, as there is no chalk in the area around Richmond, a mistake that should be amended to *ex argillaceis Richmondianis*, or from the clay pits in the area.¹⁰⁹ Huddesford also remarked in correspondence to Edward Wright that not only were specimens missing, but "erratas abound without number both in the text and plates... Mr Lhwyd corrected neither neither, nor had his Engraver good drawings of the specimens [they were likely Lhwyd's own], since many of the icons are by no means representative of the originals."¹¹⁰

Huddesford thus had some of the plates retouched or re-engraved to include more surface detail, such as for that of fossil vertebrae. The engraver was "Mr Green," most likely Benjamin Green (1739-1798), an Oxford draftsman and engraver, who had also engraved and hand-coloured illustrations of the Oxford Botanic Garden and several Oxford Almanacs in the 1760s.^[111] Huddesford not only had Green examine the specimens he would newly engrave, but also had him correct a figure legend for specimen 1656 in the table of

¹⁰⁸ Francombe to Huddesford, *ibid.*, f. 9v.

¹⁰⁹ See *Illustrations* (cit. note 100), pp. 458-459.

¹¹⁰ Huddesford to Wright, 24 March 1759, in *Illustrations* (cit. note 100), p. 467.

¹¹¹ Huddesford in a letter to Da Costa of 27 October 1758, noted: "As we have a very good Engraver in Oxford (Mr Green), he will see all the specimens he engraves," in *Illustrations* (cit. note 100), p. 465; Botanic Garden, Oxford, engraved and hand-coloured by B. Green, 18th Century, Image no MHS000010-01, Oxford University Images. In 1756 and 1757, respectively, James Green succeeded George Vertue as engraver to the University of Oxford and to the Society of Antiquaries, but he died ca. 1757. Benjamin Green was established at Oxford by 1759 and took over the engraving of the university almanac from his brother, producing the plates for 1760, 1761, 1762, and 1766 after designs by Samuel Wale. See Timothy Clayton, "Green, Benjamin," *Oxford Dictionary of National Biography*, <https://doi.org/10.1093/ref:odnb/11377><https://doi-org-proxy.library.lincoln.ac.uk/10.1093/ref:odnb/11377>; *Benedit Dictionary of British Graphic Artists and Illustrators* (Oxford: Oxford University Press, 2012), Vol. I, p. 486.

Ichthyospondyli and omit a figure of “piped waxen veins,” otherwise known as *lapis syringoides* from table CLI of *Lapidi Crystallini* (Fig. 5)

[Figure 5 preferably here]

Seventeenth-century natural philosophers thought these were *Ludi Helmonti*, prepared as a remedy for the ‘stone disease’ then sweeping through Europe, first described in J.B. van Helmont's *De lithiasi* (1644).¹¹² In contrast, naturalists working from the 1680s onwards like Lhwyd, Nehemiah Grew, and John Woodward thought these were “*stalagmites cereus, tubulorum in quibusdam calculis marinis cavitates occupans*” or aggregated marine worms, caught up into masses in the time of the Deluge. Although Woodward noted they had the texture of wood, it was not known until the time of Huddesford that they really were petrified wood, often filled with iron pyrite in large masses or in the form of slender twigs and branches. As a result, they were no longer classified as crystalline, and one of the copperplates in the ephemera was retouched to eliminate their figure. There seems to be a good deal of rubbing evident around the area of retouching on the recto of the plate; this evidence indicates alteration of the title using a burnisher, the copper levelled out with a scraper. In a process akin to *repoussage*, the plate was also beaten out from the back with a punch or small hammer to knock out the old title and achieve a smooth surface that could be cut again; Mei-Ying Sung’s analysis of the copperplates of William Blake has indicated that Blake also used *repoussage* to revise and correct his work, and that it was a common technique of alteration among engravers.¹¹³

¹¹² Ana M. Alfonso-Goldfarb, Márcia H. Ferraz, Piyo M. Rattansi, “Seventeenth-Century ‘Treasure’ Found in Royal Society Archives: The *Ludus helmontii* and the Stone Disease,” *Notes and Records of the Royal Society of London*, 2014, 68/3:227-243.

¹¹³ Mei-Ying Sung, *William Blake and the Art of Engraving* (London: Pickering and Chatto, 2009).

By these means, Huddesford updated Lhwyd's field guide for a new generation of lithoscopists, publishing 120 copies in 1760, which was the same number of copies as the 1699 edition. However, unlike Lhwyd, Huddesford was successful in publishing the work with the Clarendon Press, and several naturalists such as Lethieuller, Da Costa, Francombe, Johannes Albertus Schlosser, Edward Wright and William Borlase ordered copies in advance and promised to secure other subscribers.¹¹⁴

The creation of both editions of Lhwyd's *Lithophylacii* are witnesses to the important and often hidden role of intellectual networks, artisanal work, archival provenance and the history and bibliography in scientific book production in the early modern era. Morphological analogies and new standards of illustration of type characteristics drove the *Lithophylacii*'s creation, organisation, and new incarnation. Although the book was created for specialist collectors and natural historians, its eighteenth century edition also points to an increasing interest in preserving private papers and specimens for posterity by depositing them in public archives and publishing them posthumously, and both natural historians and antiquaries were central to this process. The natural historian emerges as a public individual through his instantiation in posthumously printed editions and in an archive and museum, particularly through the transfer of private collections into public hands. The sense that some private papers and specimen collection are worth preservation in public institutions (such as the Ashmolean Museum and the British Museum) and even preservation by the state, emerged in the history of science in the eighteenth century — before it arose in the nineteenth, and even the twentieth centuries, in the history of literature. As they collected, altered, transferred, discussed, and published natural history documents and illustrations, natural historians and antiquarians found ways of authenticating them and thus rendering

¹¹⁴ William Borlase to Huddesford, 2 February 1760, Bodl. MS Ashmole 1822, f. 73; Edward Wright to Huddesford, 1 July 1760, Bodl. MS Ashmole 1822, f. 123; Huddesford to Da Costa, 17 June 1760 in *Illustrations* (cit. note 100), p. 474. Schlosser was a Dutch medical doctor and naturalist and FRS, providing the first description of *Artemia salina* (L.) in 1755.

them, if not authoritative sources, at least starting points for further discussion, experimentation, and classification.¹¹⁵ Lhwyd's *Lithophylacii* was a nexus of such activity in the development of fossil classification and illustration.

Captions:

FIGURE 1A

Lhwyd's Drawing of a trilobite and basalt columns in his 1698 expedition notebook. BL Add MS 15067, ff. 65-66.

FIGURE 1B

The portrayal of the trilobite (probably *Cryptolithus [Trinucleus] cf. concentricus*) and the columns in Lhwyd's *Lithophylacii Britannicci ichnographia* (1699), table 23. ©The Board of Regents of the University of Oklahoma.

FIGURE 2

Sloane's specimen *Echinires galeatus vulgaris* (*Echinocorys scutatus*). The front of the specimen (left) shows the features depicted in the copperplate image. The verso (right) shows Sloane's labels, which allow it to be traced to his catalogue entry. The small label on the left is Sloane's original label, in the centre is an earlier, and heavily worn label, possibly from prior to Sloane's move to Chelsea in 1742, and the final label was added in the nineteenth century, possibly when Charles Davis Sherborne compiled an inventory of Sloane's fossil collection in 1889. ©Natural History Museum, London.

FIGURE 3A

The original copperplate, showing the species of sea urchin *Echinires galeatus vulgaris* (*Echinocorys scutatus*) by Michael Burghers. Lister copperplate uncatalogued 84. ©Bodleian Library, Oxford.

FIGURE 3B

The copper plate image from Hans Sloane's copy of *Lithophylacii*, table 12. BL Shelfmark 970.i.1. ©The British Library, London.

FIGURE 4

¹¹⁵ These points about antiquarianism are discussed in a more general sense by Roos, Vera Keller, and Elizabeth Yale in their introduction to *Archival Afterlives: Life, Death, and Knowledge-making in Early Modern Scientific and Medical Archives* (Leiden: Brill, 2018), pp. 1-28.

A page from Sloane's catalogue, on which his entry for the specimen *Echinires galeatus vulgaris* (*Echinocorys scutatus*) can be found at entry 263. The catalogue codes in the right hand margin were added after the collection was moved to Montague House. The pencil annotation on the right hand side was added by Charles Davis Sherborne in 1889. NHM, South Kensington General Manuscripts, RBR Shelf 302&303, Vol. 1, "Manuscript Catalogues of Sir Hans Sloane's Fossil Collection," f. 70. ©Natural History Museum, London.

FIGURE 5A

Table of *Ichthyospondyli*, 1699 edition of *Lithophylacii Britiannici*. ©The Board of Regents of the University of Oklahoma.

FIGURE 5B

Table of *Ichthyospondyli*, 18th-century iteration of *Lithophylacii Britiannici* by Huddesford, with specimen 1656 "Piped Waxen Veins" removed. ©The Board of Regents of the University of Oklahoma.