Snakestones: sources, samples and suppliers.

An alexipharmic in the European medical market.

Submitted by Rachael Pymm to the University of Exeter

as a thesis for the degree of

Doctor of Philosophy by Publication in History

In July 2023

I certify that all material in this thesis which is not my own work has been identified and that any material that has previously been submitted and approved for the award of a degree by this or any other University has been acknowledged.

Signature: ……..

This thesis is dedicated to my father, Dr Christopher Duffin, and my husband, Jonathan Pymm. Their constant support and encouragement helped to turn this aspiration into a reality. It is also dedicated to the memory of my mother, Yvonne Duffin (1950-2015); she would have been very proud.

Author's declaration

With reference to the joint-authored articles, Rachael Pymm estimates her contribution to those works to be as follows:

> Duffin and Pymm 2015a and 2016b, approximately 10% contribution combined across the two publications
>
> Pymm and Duffin 2020a, approximately 80% contribution

The remainder of the appended works are solely the work of Rachael Pymm.

Abstract

Focussing on the understudied area of non-herbal *materia medica* and using a highly interdisciplinary approach, this submission presents new and important conclusions regarding snakestones and their role in the European medical market, which fills multiple gaps in the current knowledge. Among its key findings, it provides the first categorisation of the different types of snakestone and identifies distinctive Scottish, Cornish and Welsh variants of the 'snakestone bead' folklore. It considers in depth the history, folklore and purported therapeutic uses of snakestones across Europe. Snakestones are also used as a vehicle by which aspects of the wider history of medicine and pharmacy, and connections with other fields of historical research, are explored. This work considers the role of snakestones in the Early Modern medical market; it examines snakestones themselves from an object-remedy perspective, as well as evaluating the scale and manner of their transmission. Previously unpublished archival evidence affords an opportunity to examine the circumstances in which a single snakestone was transmitted from Indonesia to England, and in so doing, explores the ways in which scientific societies sought information about overseas flora, fauna and phenomena, as well as how they obtained samples for their collections. This thesis also explores the interplay between overseas *materia medica* as a source of academic study, practical medical use, collection and display. This work provides new and important insights into snakestones as a remedy, complementing and extending existing scholarship surrounding Early Modern pharmaceuticals, as well as into snakebite treatments; the Early Modern medical marketplace; the interplay between natural and supernatural ailments and their treatments; scientific societies and their networks; the circulation of *materia medica*; and the role of medicine in the history of collecting.

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1. Introduction

Snakestones reveal fascinating insights into Early Modern *materia medica* and illuminate the interplay of complexities surrounding the trade and use of pharmaceuticals. This thesis provides the first focussed historical study of snakestones. It argues not only that their importance across a range of arenas, from the Early Modern medical marketplace and pharmacopoeia to pre-Modern beliefs and healing practices, has been overlooked, but that closer examination of their nature, form and dissemination can make a significant contribution to the histories of medicine, pharmacy and folklore.

The history of medicine and pharmacy is a broad field and within the sub-category of *materia medica*, the scope for scholarly enquiry is as diverse as the considerable array of substances used in the treatment of illness and injury. To date, academic attention has primarily focused on botanical materials. Non-plant-based materials, particularly zoological or mineral *materia medica*, have received much less attention, although they have figured in the therapeutic arsenal since antiquity. The earliest accounts of their use are found in ancient Egyptian, Assyrian, Babylonian, Indian and Chinese sources.[1] Thereafter, they appeared in Greek and Roman traditions, preserved in the work of authors such as Pedanius Dioscorides (c. 40-80 AD) and Pliny the Elder (23/24-79 AD). They featured in Islamic pharmaceutical works and passed into mainstream European medieval practice.

Snakestones are difficult to securely classify. Exemplars have been identified as glass beads, spindle whorls, charred bone, synthetic 'stones' and fossils. Most of these would be classed as minerals.[2] However, fictional stories of their origins often claim they are either the body parts or products of serpents, which suggests they are zoological. An argument could be made that

[1] Efraim Lev, "Traditional healing with animals (zootherapy): medieval to present-day Levantine practice," *Journal of Ethno-Pharmacology* 85, (2003): 107-109; Loren C. MacKinney, "Animal substances in materia medica: a study in the persistence of the primitive," *Journal of the History of Medicine and Allied Sciences* 1, 1 (1946): 151-5; C.J. Duffin, "Lithotherapeutical research sources from antiquity to the mid-eighteenth century," in *A History of Geology and Medicine*, ed. C.J. Duffin, R.T.J. Moody and C. Gardner-Thorpe, Geological Society, Special Publications, vol. 375 (London: Geological Society, 2013), 7-9.

[2] C.J. Duffin, "The historical roles of mineral materials in folk medicine and the development of the materia medica", (PhD thesis, Kingston University, 2018), 1.

an item *believed* to be of zoological origin should be classed as such. Snakestones could therefore be said to straddle both classifications.

This work has benefited significantly from consultation of a breadth of material, particularly folklore sources and material culture. The submitted papers make novel contributions to understudied areas of the history of *materia medica*. They consider snakestones as an object-based remedy against the backdrop of the broader Early Modern medical market. They assess the role that the snakestones played as both medicament and collectable. They consider the ailments – of natural and supposedly supernatural origin – that snakestones were used to treat. These works use snakestones to explore facets of the worldwide trade in pharmaceuticals, including their changing financial cost; the role of scientific societies; and the manner of their transmission, focussing on the importance of ‘weak tie’ relationships. This interdisciplinary work offers a range of new perspectives on important and under-researched aspects of medical beliefs, traditions and practices.

2. Historical context of research

In examining the role of snakestones in the Early Modern medical market, this thesis interacts with several historical disciplines and fields. Snakestones are primarily *materia medica* – items used therapeutically to cure humans and animals. Although predominantly used topically to treat snakebite, they were also employed against other medical complaints. Therefore, academic consideration of snakestones falls within the history of medicine, specifically the history of pharmacy and *materia medica*. This work considers a broad timespan, from the seventh-century BC to the modern-day, although the richest sources of data are from Early Modern Europe.

My qualitative approach is complemented by novel methodologies. Qualitative research is often interdisciplinary by nature, and this work consciously drew on the widest possible range of source material, which highlighted new contexts in which snakestones could be examined. This work incorporates insights from folklore studies – a field traditionally separate from historical studies – to significant effect. Medical folklore ascribed to snakestones included magico-medicinal powers to avert malevolent fairies; to cure elf-shot; or to cure by magic if rituals or incantations were employed.[3] Snakestones are therefore also considered through the lens of the history of magic. Furthermore, this work intersects with the history of collecting and the history of poisoning.

This thesis offers the first in-depth study of the range of items termed 'snakestones' in their historical contexts – particularly in lay medical treatment and remedy culture. It identifies how common folklore themes facilitated a range of disparate items being termed 'snakestones'. It diverges from the current trend in pharmaceutical history which considers ingredients of composite treatments, focussing instead on objects as discrete items of healing. It also contributes to the understudied areas of non-botanical *materia medica*. This work therefore offers an entirely new and innovative reading of snakestones and helps bridge

[3] 'Elf-shot' can describe both a disease attributed to the agency of elves, and a projectile – usually a flint arrowhead – believed to be thrown by elves. Anglo-Saxon elves were originally thought to be neutral supernatural beings, but subsequently became associated with evil. See: Alaric Hall, "Getting shot of elves: healing, witchcraft and fairies in the Scottish witchcraft trials," *Folklore* 115, (2005): 19-36; Alaric Hall, *Elves in Anglo-Saxon England. Matters of Belief, Health, Gender and Identity,* (Woodbridge: The Boydell Press, 2007); Karin Olsen, "The *Lacnunga* and its sources: the *Nine Herbs Charm* and *Wid Faerstice* reconsidered," *Revista Caraia de Etudios Ingleses* 55, (2007): 23-32.

the gaps between history and folklore. It presents new knowledge including contributions to object-based remedy culture, and under-researched areas of pharmaceutical studies.

History of Medicine

From the 1960s the academic approach to the history of medicine evolved away from iatrocentric and whiggish historical interpretations, and turned towards a social history of medicine.[4] Within this were included practitioners and remedies that had previously been scorned or overlooked: women, the poor, non-Europeans, folk healers and medicine, and the interplay between learned medicine and religion.[5] This produced new insights into the diversity and richness of historical social medicine in practice, counterpointing knowledge of great individuals, ideas and theories which emerged through studying academic medicine.

Thus, a diverse cross-section of medical practitioners and their roles in the medical marketplace were considered. Practitioners such as barber-surgeons and apothecaries sat more comfortably alongside learned medicine by virtue of semi-formalisation through guild membership, but informal healers and healing proved more difficult to identify and define. Noteworthy amongst the works addressing and re-orienting the roles of 'lay', 'informal' or 'irregular' healers, are monographs by Owen Davies and David Gentilcore respectively. Davies focused on 'cunning-folk' or "multi-faceted practitioners of magic" who offered healing alongside an array of other magical services.[6] Gentilcore explored the medical role of Italian charlatans, who were granted licences to sell medicines and practice simple forms of medicine.[7]

A great strength of Davies' analysis is the drawing together of seemingly disparate threads and synthesizing them into a full picture, using the diversity to present a landscape of practitioners and practice. Gentilcore's stated aim was to take Italian charlatans "out of the context of the 'institutionalised master

[4] Mary Lindemann, *Medicine and Society in Early Modern Europe*, 2nd ed. (Cambridge: Cambridge University Press, 2010), 4-5; Andrew Wear, *Knowledge and Practice in English Medicine, 1550-1680,* (Cambridge: Cambridge University Press, 2004), 1.
[5] Lindemann, *Medicine and Society*, 6.
[6] Owen Davies, *Cunning-folk: popular magic in English history*, (London and New York: Hambledon and London, 2003).
[7] David Gentilcore, *Medical charlatanism in Early Modern Italy*, (Oxford: Oxford University Press, 2006).

storyline' which still predominates in the medical setting".[8] He highlighted the interdisciplinary strands he employed: social history; cultural history; anthropology; sociology; historical geography; and the study of material culture.

Davies and Gentilcore's approaches are highly beneficial to the progress of the field. In studying snakestones, I have similarly wrestled with a wealth of information which appeared disparate, evolving and fluid over time and geography, which I analysed and transformed into a coherent insight into historical medicine. It became clear that consultation of a broad spectrum of sources across time and geographical space is an underused practice in this context. Qualitative data has been drawn from an array of sources: learned and lay, Latin and vernacular, songs, poetry, local, regional and national records, diaries, travel journals, field and laboratory notebooks, handbooks, pharmacopeia, catalogues, letters, transactions of academic societies and records of oral histories. It became apparent that there was a significant gulf between the history of medicine and medical folklore studies.[9] My work has sought to bridge this gap by incorporating folklore and the insights it offers into the study of the social history of snakestones, to produce a more holistic understanding of snakestones in society.

Domestic medicine, particularly remedies, has recently been the subject of increased attention. Studies of recipe collections by historians including Anne Stobart, Elaine Leong, Sara Pennell and Michelle DiMeo have produced novel conclusions.[10] Stobart, for example, found that household healthcare developed through an interplay between self-help and learned medical practitioners.[11] Medicinal recipes were exchanged between lay and learned individuals, disproving the theory that self-help arose as a result of necessity due to the

[8] Gentilcore, *Medical charlatanism*, 4.

[9] For an attempt to synthesize folk and formalised medicine in the nineteenth century see: Catherine Cox, "The Medical Marketplace and Medical Tradition in Nineteenth-century Ireland" in *Folk healing and health care practices in Britain and Ireland: stethoscopes, wands and crystals*, ed. Ronnie Moore and Stuart McClean, (USA: Berghahn Books, 2010), 55-79.

[10] Anne Stobart, *Household Medicine in Seventeenth-Century England*, (London: Bloomsbury Academic, 2016); Elaine Leong and Sara Pennell, "Recipe Collections and the Currency of Medical Knowledge in the Early Modern 'Medical Marketplace,'" in *Medicine and the Market in England and its Colonies, c. 1450-c. 1850*, ed. Mark S. R. Jenner and Patrick Wallis, (Hampshire: Palgrave Macmillan, 2007), 133-152; Elaine Leong, *Recipes and everyday knowledge: medicine, science, and the household in Early Modern England* (Chicago and London: University of Chicago Press, 2018); Michelle DiMeo and Sara Pennell, eds., *Reading and writing recipe books, 1550-1800,* (Manchester University Press: Manchester, 2013).

[11] Stobart, *Household Medicine*, 170.

inaccessibility of licensed medicine.[12] Stobart's work highlighted a mutual coaction between two spheres previously considered separate.

The focus of these works has been on remedies as preparations, or concoctions. Considering the recipes led to insights into the dynamics of the Early Modern household, the roles of women in healthcare, and changing lay beliefs about health and disease. While this contribution undoubtedly enhanced the study of the history of medicine, it also highlighted the work yet to be done. The study of medical remedies and preparations throws into sharp relief the absence of work on healing through objects – singular items, rather than composite. It also highlights a lacuna around 'magical' healing – a branch of remedy practice which involves material studies, but also consideration of rituals and incantations. This study of snakestones addresses both gaps, considering snakestones in the context of the histories of pharmacy and of magic.

History of Pharmacy

Stuart Anderson commented that the history of pharmacy is "a neglected and under-researched field" within the history of medicine.[13] For Anderson, the historiography of pharmacy followed the same path as the history of medicine until the 1960s, but has not subsequently received a social history-focussed reinterpretation.[14] Efforts to address this include John Crellin and Dennis Worthen's *A Social History of Medicines in the Twentieth Century* (2004); *The Age of Intoxication: Origins of the Global Drug Trade* (2019) by Benjamin Breen; and *Medicine and the Market in England and its Colonies, 1450-1850* (2007) edited by Mark Jenner and Patrick Wallis.[15] There is, however, considerable scope for further research.

Authors such as Frank Huisman, Patrick Wallis, Harold Cook and Timothy Walker have begun to explore the trade in pharmaceuticals in the Early

[12] Stobart, *Household Medicine*, 169-170.
[13] Stuart Anderson, "Researching and writing the history of pharmacy," in *Making Medicines: a brief history of pharmacy and pharmaceuticals*, ed. Stuart Anderson, (London: Pharmaceutical Press, 2005), 10.
[14] Anderson, "Researching and writing", 6.
[15] John Crellin and Dennis B. Worthen, *A social history of medicines in the twentieth century*, (Boca Raton: CRC Press, 2004); Benjamin Breen, *The Age of Intoxication: origins of the global drug trade*, (Philadelphia, University of Pennsylvania Press, 2019); Mark S.R. Jenner and Patrick Wallis, eds., *Medicine and the Market in England and its Colonies, c. 1450-c.1850*, (London: Palgrave Macmillan, 2007).

Modern period.[16] Huisman explained that the concept of a 'medical market' communicates a spectrum of healing options for the patient, and specialisation, popularity and competition factors for the healer, and how this concept has drawn economics and cultural considerations into the field of the history of medicine.[17] Snakestones are perhaps best understood in this conceptual landscape; their fame was as an alexipharmic, and as such they were one of many options for patients.[18] Their practical utility was based around circumstance – they were more likely to be kept as a personal first-aid item, than purchased at the point of need. They had a positive popular reputation, whereas academic opinion was mixed.

Although snakestones have a lengthy textual history, the snakestones said to generate in the head of a snake entered the English medical market consequent to the Early Modern expansion of trade networks. Cook and Walker highlighted that the "global commerce in exotic medicinal substances transformed the European pharmacopoeia."[19] They discussed Early Modern 'bio-prospecting', and the need for this to be carried out in conversation with local experts, but noted that few authors retained the cultural situating of the remedy, focused only on the material items and their marketability.[20] Wallis considered the impact of imported drugs as a measure of healthcare consumption, suggesting that increasing resort to medical practitioners in the seventeenth century was a national trend, with increased demand driving expansion of imports, causing prices to rise and preventing subsequent price falls.[21] Wallis' findings also highlighted the persistent popularity of Galenic simples, despite the growth of Paracelsianism.[22] Wallis' appendices which list drugs appearing in the London Rate Books do not include snakestones, thus, snakestones were neither rated nor imported on a large scale; their trade was instead characterised by small-scale transmission through other networks. Their

[16] See Frank Huisman, "Shaping the Medical Market: On the construction of quackery and folk medicine in Dutch historiography," *Medical History* 43, (1999): 359-375; Patrick Wallis, "Exotic Drugs and English Medicine: England's Drug Trade, c. 1550-c.1800," *Social History of Medicine* 25, 1 (2012): 20-46; Harold J. Cook and Timothy D. Walker, "Circulation of Medicine in the Early Modern Atlantic World," *Social History of Medicine* 26, 3 (2013): 337-351.
[17] Huisman, "Shaping the Medical Market," 360-1.
[18] Alexipharmic: antidotal or having the ability to dispel or counteract poison.
[19] Cook and Walker, "Circulation of Medicine," 340.
[20] Cook and Walker, "Circulation of Medicine," 342-3.
[21] Wallis, "Exotic drugs and English Medicine," 21, 37.
[22] Wallis, "Exotic drugs and English Medicine," 37.

circulation therefore provides an insight into remedy circulation via informal transmission routes.

Materia medica can be categorised as natural or chemical; natural items can then be subcategorised by type: including herbal, mineral and zoological. Stobart and Susan Francia have argued that despite the volume of research on herbal medicine, the approach to the subject has been fragmentary. For them, researchers from different disciplines have approached herbal medicine from their distinct academic perspectives with little overlap with other disciplines.[23] This is, at its heart, a call for greater interdisciplinary efforts. There is a considerable gap in the historical literature relating to non-herbal *materia medica*; particularly mineral and zoological therapeutics. This has begun to be addressed, but researchers in the field are few. Richard Sugg has published on the practice of corpse medicine, medicinal anthropophagy, and the medical use of living humans' bodily fluids.[24] Christopher Duffin has undertaken a survey of extant British eighteenth century *materia medica* collections and pioneered research into mineral therapeutics, publishing extensively on a wide range of medicinal mineral substances, including fossil echinoid spines, amber, lapis lazuli and pumice.[25] Regarding zootherapeutics, secondary literature has focussed on geographical areas – particularly the Levant and Mediterranean - or specific zootherapeutic materials, for example, endogenous concretions such as bezoars and fish otoliths; whole animals such as beetles; or body parts, such as boar's teeth.[26] Further studies will facilitate development of wider

[23] See, for example: Susan Francia and Anne Stobart, eds. *Critical Approaches to the History of Western Herbal Medicine: from Classical Antiquity to the Early Modern Period*, (London: Bloomsbury, 2014), particularly 5-9 and 289-296.

[24] Anthropophagy is the eating of human flesh by human beings. Richard Sugg, *Mummies, cannibals and vampires: the history of corpse medicine from the Renaissance to the Victorians.* (London and New York: Routledge, 2011); Richard Sugg, "Corpse medicine: mummies, cannibals, and vampires," *The Lancet* 371, (2008): 2078-9.

[25] C.J. Duffin, "British eighteenth century materia medica collections," in *Collection in the space of culture: proceedings of the international conference,* ed. I.A. Polyakova, Ch. J. Duffin and T.J. Suvorova, (Kaliningrad: Kaliningrad Regional Amber Museum, 2019), 105-124. As an introduction to mineral *materia medica* see: C.J. Duffin, "Fossils as drugs: pharmaceutical palaeontology," *Ferrantia* 54, (2008). C.J. Duffin, "Lapis Judaicus or the Jews' stone: the folklore of fossil echinoid spines," *Proceedings of the Geologists' Association* 117, (2006): 265-275; C.J. Duffin, "History of the external pharmaceutical use of amber," *Pharmaceutical Historian* 43, 3 (2013): 46-53; C.J. Duffin, "The pharmaceutical use of Lapis Lazuli in the Ancient East," *Pharmaceutical Historian* 44, 4 (2014): 84-87; C.J. Duffin, "History of the pharmaceutical use of pumice," *Geological Society, London, Special Publications* 375, (2012): 157-169.

[26] Endogenous items are those which grow or otherwise originate from within an organism. Otoliths are small structures of calcium carbonate in the inner ear of vertebrates, involved in sensing gravity and movement. For geographical areas, see: Lev, "Traditional healing with animals"; Efraim Lev, "Healing with animals in the Levant from the 10th to the 18th century," *Journal of Ethnobiology and Ethnomedicine*

assessment of the role of non-herbal *material medica* in the European medical market.

Snakestones have not previously received attention for their purported therapeutic qualities. My work therefore makes an important and original contribution to existing knowledge. Study of snakestones is complicated by the varying descriptions of the items themselves, which are explored in my work.[27] They frequently have fanciful origin stories alleging they are the body parts of snakes, or are otherwise mechanically produced by serpents, suggesting they are zoological. Exemplars in collections are often glass beads, spindle whorls, holed stones or fossilised ammonites – thus, mineral. Certain snakestones have also been said to be manmade – crafted from charred bone, or a combination of roots and earth. This produces an interesting situation whereby snakestones, depending upon their alleged origin and/or physical composition, could be said to be mineral therapeutics, zootherapeutics, artificial compositions, or even potentially human remains (if composed of calcined human bone). This work therefore complements the insights of Richard Sugg and Christopher Duffin.

Engagement with non-herbal *materia medica* from a therapeutic object perspective (see above) is an area with considerable future potential. Object remedies have been marginalised, to the detriment of the field. Source material on these remedies is often found in decentralised repositories. For snakestones, UK material was concentrated in Wales and Scotland. It has been considered 'niche' or peripheral, rather than contributory to mainstream history; the field would benefit from greater critical engagement with similar items. My work seeks to bridge these gaps, using snakestones to start drawing remedies from the margins into the body of the historical medical market. Through

2, 11 (2006); Cassandra L. Quave and Andrea Pieroni, "Mediterranean Zootherapy: A historical to modern perspective," in *Animals in Traditional Folk Medicine: Implications for conservation*, ed. Rômulo Romeu Nóbrega Alves and Ierecê Lucena Rosa, (Berlin, Heidelberg: Springer, 2013), 303-316; Luis Miguel Pires Ceríaco, "A review of fauna used in zootherapeutic remedies in Portugal: Historical origins, current uses, and implications for conservation." in *Animals in Traditional Folk Medicine*, ed. Rômulo Romeu Nóbrega Alves and Ierecê Lucena Rosa, (Berlin, Heidelberg: Springer, 2013), 317-345. For specific zootherapeutic materials, see: Maria Do Sameiro Barroso, "The bezoar stone: a princely antidote, the Távora Sequeira Pinto Collection – Oporto," *Acta medico-historica adriatica* 12, 1 (2014): 77-98, AMHA; C.J. Duffin, "Fish otoliths and folklore: a survey," *Folklore* 118, 1 (2007): 78-90; C.J. Duffin, "The medicinal uses of stag beetles," *Pharmaceutical Historian* 53, 1 (2023): 26-30, Ingenta Connect; C.J. Duffin, "Medicinal Boar's Teeth," *Acta historiae medicinae, stomatologiae, pharmaciae, medicinae veterinariae* 36, (2017): 20-34.

[27] Rachael Pymm, "'Serpent stones': myth and medical application," in *Geology and Medicine: Historical Connections,* ed. C.J. Duffin, C. Gardner-Thorpe and R.T.J. Moody, Geological Society, London, Special Publications, 452 (Geological Society, London: 2017a), 163-180.

focusing on neglected areas, this work adds to existing scholarship on the materials used in Early Modern medicine, establishes links and reveals disconnects with other therapeutic *materia medica*, and domestic remedies.

History of magic and folklore

Stephen Wilson stated that Early Modern Europeans sought to perform public, private, corporate and individual rituals "to keep away harm and evil and to procure the good, which consisted of prosperity, fertility, health and life."[28] Magic, in its various expressions, permeated society, alongside or interwoven with religion, culture and medicine. Davies highlighted that "low, popular, or folk magic is usually characterised as a rich medley of indigenous beliefs, practices and rituals… perpetrated largely through oral transmission."[29] The history of magic has proved a difficult topic to pin down, due to challenges defining 'magic' in its many guises, locales and interpretations.[30] For Davies, "magic is beyond simple definition."[31] Nevertheless, the study of the concept and practice of magic has progressed, and covers a broad timeframe: from ancient times to the present day - with changes of meanings over time, cultures and social strata being themselves a topic for study.[32] Davies produced an overview of the historiography of magic in *Magic: a very short introduction* (2012). The popularization of history in the mid-twentieth century facilitated study of the history of magic from a social history perspective. Noteworthy monographs in recent years have focussed on magic practitioners, texts, rituals, and the ideology of magic; its material culture has also been considered.[33]

[28] Stephen Wilson, *The magical universe: everyday ritual and magic in pre-modern Europe*, (London: Hambledon and London, 2000), xviii.
[29] Davies, *Cunning-folk,* x.
[30] Owen Davies, *Magic: a very short introduction*, (Oxford: Oxford University Press, 2012), 1-2.
[31] Davies, *Magic*, 2; see also: David J. Collins, "Magic in the Middle Ages: history and historiography," *History Compass* 9, 5 (2011): 410.
[32] Collins, "Magic in the Middle Ages," 410.
[33] Davies, *Cunning-folk*; Owen Davies*, Grimoires: A history of magic books*, (Oxford: Oxford University Press: Oxford, 2010); Richard Kieckhefer, *Forbidden Rites: A Necromancer's Manual of the Fifteenth Century* (Pennsylvania: Penn State University Press, 1998); Frank Klassen, ed. *Making Magic in Elizabethan England: Two Early Modern vernacular books of magic,* (Pennsylvania: Penn State University Press, 2019); Naomi Janowitz, *Icons of power: Ritual practices in Late Antiquity* (Pennsylvania: Penn State University Press, 2002); Claire Fanger, ed., *Invoking Angels: Theurgic ideas and practices, thirteenth to sixteenth centuries* (Pennsylvania: Penn State University Press: 2012); Claire Fanger ed., *Conjuring spirits: Texts and traditions of Medieval ritual magic* (Pennsylvania: Penn State University Press, 1998); Ofer Hadass, *Medicine, religion, and magic in Early Stuart England: Richard Napier's medical practice,* (Pennsylvania: Penn State University Press, 2018); Bruce Janacek, *Alchemical belief: Occultism in the religious culture of Early Modern England* (Pennsylvania: Penn State University Press,

Given the variety of meaning, forms and expressions of 'magic', historical consideration necessarily derives considerable benefit from interdisciplinarity. The same can be said of folklore studies; The Folklore Society's website indicates that it is "devoted to the study of all aspects of folklore and tradition, including: ballads, folktales, fairy tales, myths, legends, traditional song and dance, folk plays, games, seasonal events, calendar customs, childlore and children's folklore, folk arts and crafts, popular belief, folk religion, material culture, vernacular language, sayings, proverbs and nursery rhymes, folk medicine, plantlore and weather lore"[34] – such breadth draws in a multiplicity of expertise.

Peter Burke charts an overview of folklore historiography in which the origins of folklore as a concept date from 1846. Thereafter, until the 1920s there was a degree of knowledge interchange between historians and folklorists. Subsequently, until the 1970s, disciplinary boundaries became sharper; and academic professionalisation led to scholars becoming increasingly siloed.[35] Burke postulates that since the late 1960s and early 1970s an 'age of rapprochement' has existed between historians and folklorists.[36] However, there is scope for a greater level of cooperation between the two fields.

This study is enriched by folklore, which provides valuable anecdotal evidence of snakestone cures, oral traditions detailing their generation myths, and explanations as to why treatments failed. Folklore accounts demonstrate that snakestones were a consistently well-regarded first-aid remedy. In "Snakestone Bead Folklore" (2018) I compare and contrast the UK-based snakestone folklore by region, identifying distinctive snakestone origin accounts in Scotland, Cornwall and Wales.[37] This, the first study of its type on snakestones, yielded novel conclusions and is a comparator for similar studies, informing the broader picture of UK medical folklore. Thus, my work offers a

2011); Don C. Skemer, *Binding words: Textual amulets in the Middle Ages*, (Pennsylvania: Penn State University Press, 2006); Dietrich Boschung and Jan N. Bremmer, eds., *The Materiality of Magic*, (Paderborn: Wilhelm Fink, 2015); Ceri Houlbrook and Natalie Armitage, eds., *The Materiality of Magic: an artifactual investigation into ritual practices and popular beliefs*, (Oxford: Oxbow Books, 2015).

[34] "The Folklore Society." The Folklore Society, https://folklore-society.com/, accessed 25 February 2023.

[35] Peter Burke, "History and folklore: a historiographical survey," *Folklore* 115, 2 (2004): 133-5.

[36] Burke, "History and folklore," 135-6.

[37] R. Pymm, "Snakestone bead folklore," *Folklore* 129, 4 (2018): 397-419.

new perspective on how folklore and historical studies can complement each other to inform a broader social history of medicine.

History of Collecting

W. G. Burgess commented that the history of collecting requires expertise across a broad range of historical disciplines, due to the diverse content of collections.[38] The genesis of modern collections studies is *The Origins of Museums* (1985) edited by Oliver Impey and Arthur MacGregor, which focuses on museum collections of Europe.[39] Shortly thereafter, in 1989, the *Journal of the History of Collecting* was established. Impey and MacGregor's work encountered criticism, principally regarding its position that Early Modern collections were precursors to modern-day museums. Subsequent authors approached collecting from a wider anthropological perspective, and broadened their scope to consider non-European cultures and collections.[40] Recent works with a social history focus, such as Paula Findlen's *Possessing Nature* (1994) and Alison Walker, Arthur MacGregor and Michael Hunter (eds.) *From Books to Bezoars: Sir Hans Sloane and his Collections* (2012) have considered collecting in the broader contexts of social networks, and the manner in which objects were drawn together.[41]

Early Modern object collections are said to have grown from the concept of ecclesiastical reliquary collections in the fourteenth and early fifteenth centuries, when "noble European families began assembling collections of treasures as an expression of self-aggrandizement".[42] Expanding on this, Michael Ames stated: "It was common for travellers to bring back what they could find that was strange or wonderful… What was important was to select objects that would stimulate admiration and wonder and reflect upon the daring

[38] W.G. Burgess, "State of the field: the history of collecting," *History: Journal of the Historical Association* 106, 369 (2020): 110.
[39] Oliver Impey and Arthur MacGregor, eds., *The Origins of Museums: the cabinet of curiosities in sixteenth and seventeenth century Europe*, (Oxford: Clarendon Press, 1985).
[40] Burgess, "State of the field," 111-3.
[41] Burgess, "State of the field," 114-6; Robert E. Kohler, "Finders, keepers: Collecting sciences and collecting practice," *History of Science* 45, 4 (2007): 429; Paula Findlen, *Possessing Nature: Museums, collecting and scientific culture in Early Modern Italy,* (Berkeley, Los Angeles and London: University of California Press, 1994); Alison Walker, Arthur MacGregor and Michael Hunter, eds., *From Books to Bezoars: Sir Hans Sloane and his collections* (London: British Library, 2012).
[42] Sabine Haag, ed., *Masterpieces of the Kunstkammer Vienna: A brief guide to the Kunsthistorisches Museum Vienna, vol. 12.* (Vienna: Kunsthistorisches Museum Wien, 2018), 13.

exploits, special knowledge, or privileged status of the collector".[43] Thus, early collections were often accumulations of rare, unfamiliar or unusual items. However, an alternative view on their ideal purpose was held by contemporary scholars such as Samuel Quiccheberg (1529-1567), who posited in *Inscriptiones vel Tituli Theatre Amplissimi* (1565) that a collection should be a microcosm of the universe, and thus an attempt to pin down a comprehensive understanding of the world.[44] Works such as Michael Hunter's *Establishing the New Science: The Experience of the Early Royal Society* (1989) have explored this tension, highlighting that the vogue for collecting unusual objects through which to understand the world was at odds with Baconian scientists' interpretation of the world in accordance with its common objects.[45] MacGregor additionally noted that scholarly collections "were dedicated to some degree to analysing aspects of the real world instead of merely reflecting it symbolically".[46] Object accumulations prompted a search for systems of organisation and categorisation. Collections and their categorisation methods have both been topics of modern academic interest.

There is an important link between the history of collecting and the history of medicine which is not immediately apparent. Many naturalists who maintained personal collections, such as Ulisse Aldrovandi (1522-1605) and Athanasius Kircher (1602-1680), were interested in treatments and remedies, and drew on their collections for reference, information and experimentation. Additionally, MacGregor highlighted that princely and academic collections influenced the display strategy of the apothecary shop, which in turn influenced the collection of the private citizen.[47] As such, collections have strong relevance to the medical market and developments in the history of medicine. A gap in the history of collecting is a consideration of curated items from a history of medicine perspective – a noteworthy exception is bezoars, which have received

[43] Michael M. Ames, *Cannibal Tours and Glass Boxes: The anthropology of museums*, (Vancouver: UBC Press, 2007), 50.
[44] Patrick Mauriès, *Cabinets of Curiosities*, (London: Thames & Hudson, 2002), 23.
[45] Michael Hunter, *Establishing the New Science: the experience of the early Royal Society,* (Woodbridge: Boydell Press, 1989), 124; James Delbourgo, *Collecting the World: The Life and Curiosity of Hans Sloane,* (London: Penguin Books, 2017), 29.
[46] Arthur MacGregor, *Curiosity and Enlightenment: Collectors and collections from the sixteenth to the nineteenth century*, (New Haven and London: Yale University Press, 2007), 19.
[47] MacGregor, *Curiosity and Enlightenment*, 21-22; see also: Valentina Pugliano, "Natural history in the apothecary's shop," in *Worlds of Natural History,* ed. Helen Anne Curry, Nicholas Jardine, James Andrew Secord and Emma C. Spary, (Cambridge: Cambridge University Press, 2018), 44-60.

significant academic attention. This imbalance has begun to be addressed by works such as that by Margot Van Schinkel (2022), which also begins to bridge a gap through evaluation of historical non-herbal remedies through chemical analysis, and Duffin's examination of *materia medica* cabinets.[48]

Histories of material culture in various contexts are often termed the 'History of Things', after *The Shape of Time: Remarks on the History of Things* (1962) by George Kubler – which aimed to re-join objects with their ideas. This developed from a concern that historical studies were becoming too abstract, focusing on ideas and disdaining objects.[49] An alternative approach follows 'thing theory', posited in 2001 by Bill Brown, which focuses on human-object interactions. This has driven publications which focus on 'micro-histories' of individual objects in collections, such as *Tangible Things: Making History Through Objects* (2015) and *New World Objects of Knowledge: A Cabinet of Curiosities* (2021). The former work argues of micro-histories: "each one […] may initially appear to be an island, but that in unexpected or even scarcely perceptible ways [they] are all a piece of the continent, a part of the main".[50] To extend the metaphor, this thesis seeks to expand beyond the borders of the insular micro-histories, and to demonstrate that snakestones in collections are part of the continent of Early Modern medical history. The need for this is highlighted by Findlen: "The study of Early Modern material culture also needs to integrate the findings of historians of science, medicine and technology about the role of objects in making knowledge".[51]

Particularly given their relatively plain appearance, the presence of snakestones in collections is evidence that curiosity about medical utility was an aspect of collecting culture. References to snakestones in princely or academic collections are few, but significant, as they demonstrate that snakestones held a value beyond practical medical use. In a princely cabinet they were *exotica*; traded, gifted and collected for their curiosity value, and therefore spanned the divide between everyday functional objects and curiosities. In a scientific

[48] Margot van Schinkel, "A bitter pill," *The Rijksmuseum Bulletin* 70, 2 (2022): 126-145; Duffin, "British eighteenth century materia medica collections," 105-124.
[49] See, for example: Peter N. Miller, *History and its objects: Antiquarianism and material culture since 1500,* (New York: Cornell University Press, 2017), esp. 'Introduction: Why Historiography matters'.
[50] Laurel Thatcher Ulrich, Ivan Gaskell, Sara Schechner and Sarah Anne Carter eds., *Tangible Things: Making history through objects*, (Oxford: Oxford University Press, 2015), 7.
[51] Paula Findlen, "Early modern things: objects in motion, 1500-1800," in *Early Modern Things: Objects and their histories, 1500-1800*, ed. Paula Findlen, (London and New York: Routledge, 2013), 14.

cabinet, however, they were building blocks of universal and, by extension, comparative self-awareness.

Additional areas

In addition to the above, this thesis interacts with the history of poisoning and of poison treatments, as the primary purported medical virtue of snakestones was a cure for snakebite envenomization. The history of poisoning as a concept is broad. Franck Collard's *The Crime of Poison in the Middle Ages* (2008) sketches out the sparse historiography of the crime of poisoning in the European Middle Ages and investigates the crime of murder by poison, often perpetrated at a meal.[52] This itself has links to the history of collecting, particularly the acquisition of extravagant tableware which was intended to serve an alexipharmic function as well as an artistic and self-aggrandizing role (as discussed above). Frederick W. Gibbs' *Poison, Medicine, and Disease in Late Medieval and Early Modern Europe* (2019) explored approaches to poison and poisoning between 1200-1600 as medical theory, a natural philosophy, and in relationship to disease.[53]

Alisha Rankin's *The Poison Trials* (2021) considered experiments that took place to test and generate cures for poisonings, particularly for human victims. She argued that considerable method and experimentation took place in the Middle Ages and Renaissance and highlighted the interplay between learned medicine and the wider medical market that contributed to these efforts. Jutta Schickore's *About Method* (2017) focused attention on snakebite treatment in experimental methodologies. These works, in different ways, build on the article by Martha Baldwin (1990) which focused on the debate between Athanasius Kircher and Francesco Redi (1629-1698) regarding the effectiveness of snakestones as a snakebite treatment, and the importance of experimentation and repetition in Schickore's article "Trying again and again" (2010).[54]

[52] Franck Collard, *The Crime of Poison in the Middle Ages*, (Westport: Praeger Publishers, 2005), xvii.
[53] Frederick W. Gibbs, *Poison, Medicine and Disease in late Medieval and Early Modern Europe*, (London and New York: Taylor & Francis, 2019), xi.
[54] Alisha Rankin*, The Poison Trials: wonder drugs, experiment and the battle for authority in Renaissance Science*, (Chicago: University of Chicago Press, 2021); Jutta Schickore, *About Method: experimenters, snake venom and the history of writing scientifically*, (Chicago and London: University of Chicago Press, 2017); Martha Baldwin, "The snakestone experiments: an Early Modern medical debate," *Isis* 86, 3

My snakestone study takes the novel approach of focusing on a particular snakebite remedy, its qualities, purported operation and comparative availability, thereby providing an interesting alternative insight into the history of poisoning, and the anti-snakebite arsenal.

Literature review – snakestones

Modern secondary literature on snakestones is sparse. Three noteworthy works were published in the early twentieth century: ""Snakestones" and stone thunderbolts as subjects for systematic investigation" (1912) by W.W. Skeat; *The Magic of Jewels and Charms* (1915) by George Kunz; and "Snake Stones" (1921) by W.R. Halliday.[55] Walter William Skeat (1835-1912) was a philologist, and prolific in his output. His article on snakestones and stone thunderbolts was a departure from his philological body of work; in it he sought to raise awareness of "fossil folklore" in the context of "fossil forms which have given birth to folklore elements of various kinds".[56] Skeat collated a wide range of references to diverse items termed snakestones. He included snake-related folklore such as that pertaining to serpent's tongues (*glossopetrae*) and touched on the idea of sympathetic medicine.[57]

Skeat, a deacon and later curate in the Anglican Church, posited that folk belief in the power of snakestones and stone thunderbolts formed "part of the religion of these [British] islands" and demonstrated "a possible link" between Celtic and Hindu beliefs.[58] Skeat asserted that this work aimed to "focus attention on this class of facts and on the system required for investigating them".[59] He was successful in his first aim and his work highlighted snakestones as a rich vein of potential study, however, the 'system' was not clarified.

(1995): 394-418; Jutta Schickore, "Trying again and again: multiple repetitions in early modern reports of experiments on snake bites," *Early Science and Medicine* 15, 6 (2010): 567-617.

[55] Walter W. Skeat, ""Snakestones" and Stone Thunderbolts as Subjects of Systematic Investigation," *Folklore* 23, 1 (1912): 45-80; W.R. Halliday, "Snake Stones," *Folklore* 32, 4 (1921): 262-71; George Frederick Kunz, *The Magic of Jewels and Charms*, (Philadelphia: J.B. Lippincott Company, 1915).

[56] Skeat, "Snakestones," 45.

[57] *Glossopetrae* are fossilised shark teeth; on their magico-medicinal attributions see: C.J. Duffin, "Natternzungen-Kredenz: tableware for the Renaissance nobility," *Jewellery History Today* 14, (2012): 3-5; and C.J. Duffin, *Snakes' tongues, serpents' eyes and sealed earths: geology and medicine in Malta*, Occasional Papers of the St John Historical Society, (London: St John Historical Society, 2019).

[58] Skeat, "Snakestones," 80.

[59] Skeat, "Snakestones," 45.

American mineralogist and gemmologist, George Kunz (1856-1932) devoted 19 pages of *The Magic of Jewels and Charms* to snakestones. They appear in a chapter alongside bezoars, demonstrating that Kunz saw parallels between them. Like Skeat, Kunz collated an array of references. Comparing Kunz's text to Skeat's, a notable difference is Kunz's attempts to identify the substances termed 'snakestones', alighting upon echinoids and glass beads among others.[60] Kunz additionally hypothesized that some snakestones may have been tabasheer.[61] Although Kunz was sufficiently persuaded to repeat this theory in subsequent works, it does not appear to have gained traction amongst subsequent authors, nor is it compelling.

The article by William Reginald Halliday (1886-1966), historian and archaeologist, likewise excelled in identifying a wide diversity of snakestone folklore. Halliday placed a greater emphasis on the supposed magical qualities of snakestones, and included the dragonstone (*draconites*), a stone omitted by Skeat and referred to only briefly by Kunz.[62] Halliday summarised the snakestones of classical authors broadly, as "stones… which by their shape or markings resemble snakes".[63] Halliday noted Pliny's account of the *ovum anguinum,* plus Cornish and Welsh snakestone folklore, and concluded these items were either fossil sea urchins, coral or glass beads.[64] Regarding the stones said to be from the heads of snakes, Halliday briefly hypothesised that a folkloric association may have been made with serpents' "jewelled appearance" and their "phenomenon of fascination", which evolved into folklore of a magical stone inside their heads.[65] In support of this he referenced legendary animals said to have visible glittering forehead stones, and endogenous concretions (principally bezoars) harvested from other animals. Halliday's article suggests that he was aware of Skeat's work but, may have been incognizant of Kunz's.

These works evidenced a significant body of snakestone sources, and that the diversity of objects and their folklore complicated study. Building on

[60] Kunz, *The Magic of Jewels and Charms*, 223 and 226.
[61] Tabasheer: a white substance obtained from the joints of some species of bamboo; it is an ingredient in traditional Indian and Chinese medicines.
[62] Kunz, *The Magic of Jewels and Charms*, 10-11.
[63] Halliday, "Snake stones," 264.
[64] Halliday, "Snake stones," 268.
[65] Halliday, "Snake stones," 265.

these surveys, I generated a categorisation system for snakestones permitting greater clarity on the various strands of snakestone lore.[66]

Once a categorisation system existed, research avenues into the different types of snakestones emerged. Regarding dragonstones, for example, while works on dragons are numerous, only a short article by Niamh Whitfield (2010) focused exclusively on dragonstones, from an Irish folklore perspective.[67] Complementing Whitfield's article, I generated a wide overview of dragonstone references from the third century BC to the seventeenth century.[68] My work identifies the key features of early accounts, derivative literature and a divergence of tradition in the thirteenth century. It also considers the appearance of dragonstones in non-academic, vernacular and artistic works which demonstrates the extent to which dragonstone beliefs permeated society beyond academe. An aspect of this is further explored in our hypothesis that the Miseroni dynasty of hardstone craftsmen, based in Milan and then Prague in the sixteenth and seventeenth centuries, adorned various of their vessels with representations of the dragonstone to sympathetically harness its alexipharmic qualities which, alongside the medicinal virtues of the hardstone base and the jewelled accents, resulted in a purportedly powerful alexipharmic vessel.

UK snakestone lore is largely associated with small annular glass beads or spindle whorls. Stand-alone works on this topic are rare, with references instead scattered throughout primary and secondary literature. Prys Morgan's "A Welsh Snakestone: its tradition and folklore" (1983) is an exception and addressed snakestones through the unique perspective of the hereditary owner of an pedigreed exemplar.[69] My articles "A charm to impose on the vulgar" (2017) and "Snakestone Bead Folklore" (2018) seek to expand study on this

[66] Rachael Pymm, "'Serpent stones': Myth and medical application," *History of Geology Group: "Geology and Medicine: Exploring the Historical Links and the Development of Public Health and Forensic Medicine" 2-4 November 2015*, conv. Richard T. J. Moody, Chris Duffin and Christopher Gardner-Thorpe, (London: The Geological Society, 2014), 27-28; Pymm, "Serpent stones," (2017a), 163-180.
[67] Niamh Whitfield, "Dragon-stones: the fabulous gems," in *A Grand Gallimaufry: collected in honour of Nick Maxwell*, ed. Mary Davies, Una MacConville and Gabriel Cooney, (Dublin: Wordwell, 2010), 79-82.
[68] Rachael Pymm and C J. Duffin, "Dragonstones: Myth, magic, medicine and material culture," in *Medical Heritage of the National Palace of Mafra*, ed. Maria Sameiro do Barroso, C.J. Duffin and Germano de Sousa, (Cambridge: Cambridge Scholars, 2020a), 205-256.
[69] Prys Morgan, "A Welsh Snakestone, its tradition and folklore," *Folklore* 94, 2 (1983): 184-91.

type of snakestone; the former focuses on the medical and magical uses of this snakestone, whereas the latter elucidates its folklore. [70]

Regarding the snakestone allegedly sourced from the head of a serpent, Baldwin's "The Snakestone Experiments" (1995) is the authoritative modern work.[71] Baldwin provided a wealth of detail about the debate between Jesuit natural philosopher Athanasius Kircher and Florentine physician Francesco Redi over the effectiveness of snakestones as a medical treatment for snakebite envenomization. Baldwin provided an excellent insight into the two protagonists and their approaches to imported snakestones in the 1600s, examining their approaches to experimental 'trials' using the stones, as well as their circumstances, cultural and religious contexts. Baldwin's footnotes provided significant information about the circulation of snakestones in the seventeenth century. She explores the lack of authority that experimental trials received, versus the authority of anecdote. Baldwin's article is a bedrock to my work on this type of snakestone. "Snakestones in Early Modern medicine and society" (2020) explores the composition and identifying characteristics of this type of snakestone and seeks to bridge a gap in the knowledge about receptivity to and practical utilisation of the snakestone in the European medical market, alongside the array of alternative alexipharmics available.[72] Artificial alexipharmic and pharmaceutical 'stones' are surveyed in two articles in *Pharmaceutical Historian* (2015).[73]

Baldwin suggested that European interest in snakestones may have been partly due to the return of Polish Jesuit missionary Michal Boym (*c*. 1612-1659) from China, and his subsequent publication *Flora Sinensis* (1656). In this, Boym indicated that snakestones as a remedy originated in China. Conversely, Belgian philosopher Ulrich Libbrecht (1928-2017) and historian Marta Hanson, separately discussed the seventeenth century introduction of snakestones *into* China *from* Europe, citing Flemish Jesuit missionary, Father Ferdinand Verbiest

[70] Rachael Pymm, "'A charm to impose on the vulgar': the medicinal and magical applications of the snakestone bead within the British Isles," in *Geology and Medicine: Historical Connections,* ed. C.J. Duffin, C. Gardner-Thorpe and R.T.J. Moody, Geological Society, Special Publications 452. (London: The Geological Society, 2017b), 181-194; Pymm, "Snakestone Bead Folklore," 397-419.
[71] Baldwin, "The Snakestone Experiments," 394-418.
[72] Rachael Pymm, "Snakestones in Early Modern medicine and society," *Pharmaceutical Historian* 50, 4 (2020): 129-145.
[73] C.J. Duffin and Rachael Pymm, "A Survey of Artificial Pharmaceutical 'Stones' – Part 1," *Pharmaceutical Historian* 45, 1 (2015a): 2-9; C. J. Duffin and Rachael Pymm, "A Survey of Artificial Pharmaceutical 'Stones' – Part 2," *Pharmaceutical Historian* 45, 2 (2015b): 28-33.

(1623-1688), who translated European writings on snakestones into Chinese.[74] This apparent inconsistency has not been satisfactorily resolved. My research suggests that the situation may not be a clear-cut 'one or the other'; it is likely snakestones originated in ancient Asia, and appearance of snakestone folklore elsewhere was a consequence of transmission through various networks. There is also the phenomenon of folklore being 'forgotten' from an area and, after passage of time, reintroduced as a foreign import.[75] Libbrecht's and Hanson's articles demonstrated the effectiveness of Jesuit networks in the circulation of medical knowledge. "Snakestones in Early Modern medicine and society" (2020) complements this by considering the ownership, distribution and value of snakestones in Europe, and their circulation via the seventeenth century shipping routes. This is further explored in "Transmitting medical exotica: Louis Philiberto Vernatti, the Snakestone and the Royal Society" (2020) where archival material was interrogated to provide a rare insight into transmission of a single snakestone specimen from Indonesia to England in the seventeenth century.[76] It also highlights the approach of the Royal Society, London towards collecting items for their Repository during its earliest years, exploitation of 'weak tie' relationships. The same archival material contained a unique first-hand insight into recreational use of *Datura* in the seventeenth century. While modern investigations into *Datura* intoxication are numerous, extant seventeenth century accounts are from the perspective of a third-party physician or observer. This data presented a non-physician's first-hand user's account, filling a notable gap in the literature.[77]

Some modern medical works make brief reference to present-day treatment of snakebite envenomization using snakestones. A paper authored by Jean-Philippe Chippaux et al focussed on the snakestone and through scientific experimentation concluded that snakestones were ineffective at extracting

[74] Ulrich Libbrecht, "Introduction of the Lapis Serpentinus into China," *Orientalia Lovaniensia Periodica* 18, (1987): 209-37; Marta E. Hanson, "Jesuits and Medicine in the Kangxi Court (1662-1722)," *Pacific Rim Report* 43, (2007): 1-12.

[75] See the example of Sri Lankan snakestone folklore in Pymm, "Snakestones in early modern medicine and society," 138-9.

[76] Rachael Pymm, "Transmitting medical exotica: Louis Philiberto Vernatti, the Snakestone and the Royal Society," *Pharmacy in History* 62, 3 and 4 (2020c): 112-134.

[77] See Rachael Pymm, "An account of recreational Datura intoxication at Leiden University in the seventeenth century," *Pharmaceutical Historian* 51, 4 (2021b): 97-105.

venom from a wound.[78] "Snakestones in Early Modern medicine and society" (2020) draws together strands of belief regarding the operation of the snakestone, evaluations of its absorptive properties by Libbrecht, data on snakebite, and assessments of suction as a mode of treatment, to support the conclusions of Chippaux et al.[79]

Conclusion

My work on snakestones intersects with key aspects of the history of medicine, bridging a number of gaps in the field. It is a social history, which focuses on an individual remedy, exploring the ways and reasons for which it was employed. It advances research in the neglected social history of pharmacy, specifically *materia medica*. It considers snakestones as a non-herbal remedy, thus advancing this understudied area, and takes an object-specific perspective, rather than a concoction or recipe-based perspective.

The works in this thesis present a new and original reading of snakestones and their role in the European medical market. They draw in folklore evidence, demonstrating the value that folklore studies can bring to historical research. Novel findings include the identification of regional trends in snakestone-related beliefs in Wales, Cornwall and Scotland. Folklore evidence presents an opportunity to engage with snakestones as magical remedies, and with the relationship between magico-medicinal remedies and religious aspects of Early Modern life.

Consideration of snakestones in collections brings a history of medicine perspective to this study. These papers engage with work on the Early Modern pharmaceutical trade and seek to draw comparisons and highlight contrasts between the trade in snakestones and importation of other *materia medica*. In sum therefore, this thesis addresses a number of gaps in the current state of research, pushes boundaries with its breadth and the scope of sources consulted, and makes new and unique contributions to a number of historical fields.

[78] Jean-Philippe Chippaux, Ismaila Diédhiou and Roberto Stock, "Étude de l'action de la pierre noire sur l'envenimation expérimentale," *Sante* 17, 3 (2007): 127-31; Jean-Philippe Chippaux, Blanca Ramos-Cerrillo and Roberto Stock, "Study of the efficacy of the black stone on envenomation by snake bite in the murine model," *Toxicon* 49, (2007): 717-720.

[79] Libbrecht, "Introduction of the Lapis Serpentinus into China."

3. Contribution of this thesis to the current knowledge

The appended works present novel readings of snakestones and their role in the European medical market. They advance the field of social pharmaceutical history through an object-based approach to the study of *materia medica*. They also draw on folklore sources, incorporating a history of magic perspective and generating a more holistic view of perceptions of snakestones in Early Modern society. Snakestones bring a history of medicine perspective to collection studies, and contribute to knowledge on the trade in pharmaceuticals, and the history of poisoning. To further expand on the significance of my work, this section highlights the specific contributions made in the publications that comprise my thesis.

Types of Snakestone (Pymm 2014, 2017a)

A natural starting point was to identify what was meant by 'snakestone'. A survey of the literature demonstrated significant diversity in the physical description of snakestones, for example, in their colours: including black, green and white; and in shape: including a ring, lenticular, and a coiled horn. Similarly, while there was often overlap, the fabled origins of snakestones and the illnesses or injuries they were used to treat were varied. One of the main products of my research was identifying five 'types' of snakestones: dragonstones, snakestones (from the cranium of a serpent), ammonites, snakestone 'beads' and serpentinite.[80]

Dragonstones (Pymm 2017a; Pymm and Duffin 2020a)

My work on dragonstones draws together for the first time the primary records on this type of snakestone. It charts the evolution of dragonstone lore through literary sources, identifying key turning points and the reasons for them. It considers vernacular sources, which provide insight into permeation of dragonstone lore into non-academic sections of society. Additionally, it engages with material culture, identifying representations of dragonstones on Renaissance tableware. We conclude that particular vessels were made with an

[80] Pymm, "'Serpent stones': Myth and medical application," (2014); Pymm, "Serpent stones", (2017a).

alexipharmic purpose, and gems were sited to represent the dragonstone, in order to sympathetically imbue the vessel with dragonstone's supposed virtues.

Dragonstones (*draconitis, draconities, dracontia*) were typically described as white or translucent gems, perhaps similar in appearance to a diamond, and were said to naturally generate inside the cranium of their eponymous host. Thus, they needed to be captured from the beast. A vivid, fictional description of such a mission was given by Philostratus (c. 172-250 AD) in his *Life of Apollonius of Tyana*. It described how a dragonstone could be harvested, but emphasised the inherent danger by noting that hunters were dragged into the dragon's lair.[81]

Aspects of Philostratus' dragonstone harvesting methodology are common to instructions for the acquisition of other supposedly medicinal stones from their animal hosts: the need to lure the animal to sleep; use of a red cloth; use of specific words; and the requirement to remove the stone while the animal was still living. These strongly link the dragonstone to the corpus of similar zoological medicaments, despite the fictional host (for example, excluding specified words, all features can be found in toadstone folklore; a verbal formula to compel a snake to release its stone features in the fourth century work *Kyranides*).[82] This link is particularly significant as, in contrast to other supposed animal-generated stones, most later accounts are silent as to the dragonstone's medicinal use. The parallels hint at an original medical use. This is corroborated by the Greek word *drakōn* (for dragon), which is etymologically connected with sight. Two early accounts use this: *New History* by Ptolemaeus Chennus (unknown, *c*. 98-138 AD), suggested the dragonstone could reveal the invisible.[83] Secondly, an epigram by Posidippus of Pella (*c*. 310-240 BC) inferred that the stone granted exceptional eyesight.[84] Pliny's account of the dragonstone, however, was devoid of any rhetorical associations, and this account formed the bedrock of textual tradition. The subtle associations thus

[81] Philostratus, *The Life of Apollonius of Tyana*, trans. Edward Berwick, (London: T. Payne, 1809), 133.
[82] C.J. Duffin, "The Toadstone – a rather unlikely jewel,", *Jewellery History Today* 8, 2010: 3; Anonymous, *The Magick of Kirani, King of Persia, and of Harpocration Containing the Magical and Medicinal Vertues of Stones, Herbes, Fishes, Beasts and Birds: A Work much Sought for by the Learned but Seen by Few: Said to have been in the Vatican-Library in Rome but not to be Found there nor in all the Famous Libraries of the Empire/Now Published and Translated into English from a Copy Found in a Private Hand*. (No publisher: London, 1685), 151-2.
[83] Marc Shell, "The ring of Gyges," *Mississippi Review* 17, (1989): 37.
[84] Kathryn J. Gutzwiller, "Cleopatra's ring," *Greek, Roman and Byzantine Studies* 36, 4 (1995): 387-388.

abandoned, Pliny's work is silent on the purpose of collecting a dragonstone, leaving only the supposition that possession itself was the aim.[85]

The dragonstone was strongly represented in European manuscripts through to the seventeenth century. Until the thirteenth century, accounts were largely derivative of Pliny. However, in *De Mineralibus* (1261-2), Albertus Magnus (*c*. 1200-1280) advanced a very different interpretation. He equated and possibly conflated dragonstones with the stones reputed to be taken from the head of a snake. This conflation is unsurprising, as the original Latin and Greek terms in Magnus' sources rendered it difficult, if not impossible, to precisely identify the ophidian described. In an entry sub-titled '*Draconites*', Magnus used *dracones* (dragon) when describing the stone's host, until he began his personal reflections, where he used *serpentes* (serpent). He described the 'dragonstone' he found beneath a heap of deceased snakes as shaped like a truncated pyramid, black, with a pale stripe around it. Magnus justified this unusual appearance as consequent to the stone being collected from a deceased host, suggesting its appearance may have been closer to Pliny's description if it were taken from a 'living' snake. Importantly, Magnus re-introduced an alexipharmic component to the dragonstone legend, through conflation with the snakestone (whose primary virtue was believed to be alexipharmic). Thereafter, derivative accounts tended to follow either the precedent of Pliny, or the divergent tradition of Magnus.

A survey of key European works which featured the dragonstone is presented in Pymm and Duffin 2020. Importantly, we identified *draconites* in non-academic (identified by their use of the vernacular) European works: *Der Naturen Bloeme* by Jakob van Maerlant (*c*. 1235-1290); *Das Buch der Natur* by Konrad von Megenburg (1309-1373); the Lapidary of Pseudo-Mandeville (fourteenth century); and *Li fet des Romains* (*c*. 1213-14) by an anonymous author. The presence of dragonstones in such works demonstrates that dragonstone lore was accepted by and featured in societal spheres beyond academe.

This is supported by representations of dragonstones in material culture. An illumination in a manuscript of the Alexander Romance, *Le livre et la vraye hystorire du bon roy Alixandre* (Royal MS 20 B XX, f. 73r), once owned by

[85] Pymm, "'Serpent stones," (2017a), 167; Pymm and Duffin, "Dragonstones," 14.

Henry VIII, is particularly striking. It shows Alexander and his men fighting five dragons, each with a large green stone atop their heads. A mid-fifteenth century nautilus shell nef, held by the Museo de Tapices, Catedral del Salvador in Spain features a silverworked dragon as its base, with a prominent jewel on its forehead. Furthermore, the Kunstkammer Wien (Kunsthistorisches Museum, Vienna), Austria, holds a collection of hardstone vessels produced by the Miseroni dynasty of craftsmen, based in Milan and Prague. Several of these feature dragons or serpents with a stone atop their heads. We contend that the forehead stones were representations of dragonstones and snakestones, and were intended to sympathetically complement the supposed medicinal virtues of the vessels' base material and the precious gemstone adornments. Thus, they demonstrated the wealth and prestige of the owner, supposedly imbued the victuals inside them with medicinal virtue, and dispelled or neutralised any poison. In this way, the history of medicine intersects with the history of collecting, also identifying an avenue for further research.

Snakestones (Pymm 2015a, 2015b, 2017a, 2020b, 2020c)

These works draw together elements of snakestone lore from disparate sources, identifying key themes and features, to generate the first European-wide survey of snakestones. They consider the development of medical theory surrounding snakestones: from apotropaic, to similitude, to broadening of applications.[86] They evaluate the theories advanced about the physical composition of snakestones, assess the reception, use and perceived value of snakestones, and seek to evaluate their comparative worth. They draw novel conclusions about the role of snakestones in the European medical market.

The preponderance of snakestone accounts concern the stones reputedly generated in the cranium of a serpent. These stones go by a variety of names, many of which reflect their supposed ophidian origin: *pierre de serpent, Piedra de cobra, slangensteen, pamboo kaloo, schlangenstein*, alongside more general monikers, such as Belgian Black Stone. While sources vary, these snakestones are generally described as small (two inches or less in length), black (sometimes lighter in hue in the middle), flat or with one convex surface, smooth and lightweight. Their reputation for being an effective

[86] Apotropaic: to supposedly have the power to avert evil influences.

treatment for snakebite likely stems from their adherence to the site of an incision. Applied topically, they adsorb the bodily fluids from a bite or wound, adhering strongly to the skin. Once the surface liquids are no longer sufficient to maintain the connection, the stone will detach. Medical folklore deems that this is due to the stone either being 'full' of the poison it has imbibed or there being no poison remaining in the wound to be extracted. The stone should thereafter be steeped in milk (sometimes accounts substitute water) to dispel the venom. Some accounts claim that during this process the liquid will bubble or become discoloured. Thus 'cleaned', the stone is ready for re-use. Early accounts credit the stone with successful treatment of diseases caused by excessive phlegmatic humor, its adsorptive properties being mistaken for absorption.

The work of Islamic alchemists ascribed apotropaic qualities to snakestones, and recommended they be worn as amulets to ward away serpents.[87] Thereafter, developing medical theory considered that snakestones operated under the theory of sympathetic attraction, or 'like cures like'; a stone from a serpent was (and in some parts of the world still is) considered able to attract snake venom because of their common ophidian nature. Over time and perhaps following desperate experimentation in the field, the snakestone was credited with curing envenomization by other poisonous creatures: spiders, scorpions, centipedes, Scorpion Fish, catfish, and wasps.[88]

Positive identification of the snakestone's physical composition was a topic of interest from the seventeenth to nineteenth centuries. Some seventeenth century authors, such as Jean de Thévenot (1633-1667) and John Ovington (1653-1731), themselves responsible for perpetuating dissemination of snakestone folklore through their travel writings, were sceptical of the ophidian origin folklore. Alternative theories were advanced that snakestones were bezoars, charred hartshorn, charred bone or manufactured compositions. Regarding the latter, French pharmacist Pierre Pomet (1658-1699), in *A Compleat History of Drugs*, provided a recipe for manufacture of a snakestone from a variety of alexipharmic ingredients; combined, they would be considered powerful against envenomization. Innovation in manufactured or 'artificial' stones was high in the seventeenth and early eighteenth centuries. An

[87] Pymm, "'Serpent stones," (2017a), 169.
[88] Pymm, "Snakestones in Early Modern medicine and society," 132.

increasing variety entered the pharmaceutical market as Paracelsianism emerged alongside Galenism, and compositions were created from a combination of ingredients designed to produce a specific overall effect. Advantageously for apothecaries, once manufactured, they were easily transported and stored, had a relatively long shelf life and could be administered easily with a standardised dosage. Alexipharmic compositions were numerous and, aside from snakestones, included the Lapis de Goa, bezoar substitutes, *Lapis Contrayerva, Lapis Alexiterius*, Treacle Stone and *Lapis attrahens venenum*.[89]

Hartshorn and bone have a very similar chemical composition – hydroxyapatite or hydrated calcium phosphate. It is likely that many of the snakestones described in the literature are charred bone. This was suspected by some early authors, such as British apothecary Samuel Dale (1659-1739). Modern research on burnt human remains has evidenced the colour variation on bones – a darker outside, and a lighter central colour – as an effect of the burning process, which is persuasive. A twenty-first century 'Black Stone' from Bangladesh, marketed as a first aid 'Cure of Snakebite', is clearly cortical bone. Additionally, modern reports from Africa and Peru describe how snakestones should be crafted from bone.[90]

Despite evidenced interest from some, identification of the material component(s) of the snakestone was of a secondary significance to confirming its medical efficacy in the seventeenth century. Snakestones unexpectedly drew considerable scholarly attention as the focal point of a public debate between Jesuit natural philosopher Athanasius Kircher and Florentine physician in the Medici court, Francesco Redi. Based on limited trials and the word of fellow Jesuits, Kircher believed absolutely in the medical efficacy of the snakestone to treat snakebite, using them as evidence of his theory of 'magnetic forces', which was underpinned by the Paracelsian principle of similitude. Redi, conversely, undertook numerous trials using snakestones and firmly concluded they were medically useless. Played out in the public eye through a series of publications, Kircher and Redi's work piqued the interest of contemporaries across Europe: trials were carried out in the closing decades of the seventeenth century by

[89] Duffin and Pymm, "Artificial Pharmaceutical 'Stones' – Part 1,' (2015a); Duffin and Pymm, "Artificial Pharmaceutical 'Stones' – Part 2,' (2015b).
[90] Pymm, "Snakestones in early modern medicine and society," 134.

German Otto Tachenius (1610-1680), an anonymous author in Vienna (whose trials were 'administered' by Kircher), Moyse Charas (1619-1698) in France, and Edward Tyson (1651-1708), Richard Mead (1673-1754) and Robert Boyle (1627-1691) in England. An academic consensus on the snakestone's ability or otherwise to cure envenomization by snakebite was, however, never reached.

Responding to a gap in the knowledge, in Pymm 2020b consideration was given to the reception, value and use of snakestones, and their role as a medical treatment. Anecdotal evidence suggested that the snakestone was in regular use in India and the surrounding areas, and the East Indies. They were manufactured by Brahmins and sold to lower castes and Europeans. Europeans living and travelling overseas were particularly interested in snakestones and treated them as personal amulets, first-aid treatments, and exotic curiosities which they kept in personal collections, as per the fashion at home in the West.[91] Exotic medicaments were additionally of interest to European natural philosophers and scientific societies for a combination of reasons – European exposure to unfamiliar illness, disease and injury brought with it the practical need to acquire medical knowledge to keep personnel safe. Jesuits and other missionaries desired to broaden their medical knowledge to further their Christian aims to care for the sick, and to complement their evangelistic endeavours. Scientific societies, sharing these motivations, also had an academic interest, and needed to consider the wishes of powerful patrons, such as King Charles II (1630-1685) who was gifted snakestones and sought confirmation of their genuineness and efficacy.[92]

Acknowledging the difficulties of establishing the comparative contemporary worth of historical items, a tentative assessment was made using reported costs from snakestone purchasers, historical currency exchange rates and average wage information. The data demonstrated that in the mid- to late-sixteen hundreds, snakestones were relatively inexpensive, costing approximately the daily wage of an unskilled labourer. Their value increased by the mid-seventeen hundreds to the equivalent of 10 times the daily wage, and to the height of 25-30 times the daily wage in the late-seventeen hundreds,

[91] Brahmins are the priestly caste in Hindu society.
[92] Pymm, "Snakestones in Early Modern medicine and society," 135.

before falling again in the early eighteen-hundreds, but not so far as to match its original low cost.

The practical affordability and appeal of the snakestone as an alexipharmic is a factor in assessing the social significance of snakestones in the medical market. Snakestones provided an opportunity to consider the role of a single-object remedy, thus complementing recent scholarship on ingredients or composite remedies. Focusing on the United Kingdom, snakestones were unlikely to be owned by the average English household. Snakestones were required to be used whole, whereas bezoar scrapings or theriac were purchasable in small amounts by weight, thus more cost-effective at the point of need – particularly as snakestone prices soared. In England, the practical need for imported snakestones was low, due to the comparative dearth of venomous snakes, and native remedies for snakebite already existed, as did a native 'snakestone bead' mythology (see below). Therefore, snakestones were the subject of much interest, but less of a household remedy and more commonly kept as curiosities by the rich and powerful, and investigated by natural philosophers with an interest in envenomization and its treatment. These conclusions are subject to regional variations and the limitations of the data at hand, and thus should be treated with caution, but nonetheless are helpful in building a broader picture of the role of snakestones on the wider stage.

Circulation of medical knowledge (Pymm 2020b, 2020c, 2021)

Snakestones also provided an opportunity to examine the circulation of medical specimens in the seventeenth century. These works consider the ways in which snakestones were traded, compared with other pharmaceuticals and collectable *exotica*. Unpublished archival records permitted exploration of the circumstances in which a single specimen was sent from Indonesia to England. This shed light on the activities of scientific societies in their earliest years, and complements work undertaken on the importance of 'weak tie' relationships in this context. The same records provided a first-hand account of recreational *Datura* intoxication, penned by the ingester, a medical layperson. This perspective is missing from existing records and provides early evidence of recreational use and of ingesters suffering cyclopegia.[93]

[93] Cyclopegia is paralysis of the ciliary muscle of the eye, resulting the loss of ability to focus.

Agreeing with authors such as David Ogden, snakestones as a concept likely originated in India, with pre-seventeenth century gradual transmission eastwards and westwards, noting that snakestones appear in the fourth century Greek work *Kyranides*, and Islamic works of the tenth century.[94] When encountered in the Early Modern period, snakestones were frequently conveyed into and out of Europe by Jesuit missionaries: Jesuits gifted them to the rulers of Tuscany, Brunswick-Luneberg, Vienna and Beijing. They were also a gift from ruler to ruler. Individual travellers also transported specimens during their journeys.

Unpublished Royal Society archival records enabled the reconstruction of the circumstances of solicitation and transmission of a single snakestone specimen from Indonesia to England in the 1660s. A relationship was identified between Sir Robert Moray (1608/9-1673), newly elected President of the fledgling scientific society, and the historically obscure Louis Philiberto Vernatti (1627-69), a lawyer in the employ of the Dutch East India Company (VOC), based at their factory in Batavia, Java (Jakarta, Indonesia). Moray and the Vernatti family became friends when both resided in Scotland, and the young Louis was an infant. Vernatti retained an enduring affection and admiration for Moray, and when the latter wrote to him in November 1662, enclosing a list of varied enquiries about the East Indies on behalf of the Royal Society, Vernatti was pleased to assist. This broad approach exemplifies the way the Society sought to acquire information in its earliest years – they swiftly reverted to more focussed enquiries. It also demonstrates the importance of 'weak tie' relationships (positive, but shallow social connections) to seventeenth century correspondence networks – as identified by Lux and Cook.[95] Snakestones were predominantly circulated by individual purchasers via limited personal networks, more akin to the transmission methods characterising the trade in curiosities, rather than the formal large-scale trade in pharmaceutical items via shipping companies.

Moray's overture to Vernatti was unusual. In many ways it mirrored other contemporary requests: it was broad in scope and sought both information and

[94] David Ogden, *Drakōn: Dragon Myth and Serpent Cult in the Greek and Roman Worlds*. (Oxford: Oxford University Press, 2013), 176.
[95] David S. Lux and Harold J. Cook, "Closed circles or open networks?: Communicating at a distance during the Scientific Revolution," *History of Science* 36, 2 (1998): 179-211.

specimens for the Royal Society's encyclopaedic Repository. The Society had an interest, albeit not exclusive, in the East Indies, and enquiries were made of other shipping company employees. It was not even Vernatti's Dutch heritage which made the contact unusual (notwithstanding the contemporary international tensions and Anglo-Dutch Wars), but rather his permanent residence in the East Indies and his employ by the VOC, a rival to the English East India Company. Nonetheless, Vernatti acquiesced and returned a lengthy letter answering the Fellows' queries and a box of items, including a snakestone. Vernatti's letter was excitedly received, published, and its information further pursued. The box of items was by far the largest overseas gift that the Society had yet received, demonstrating the high value that weak tie relationships potentially had to a scientific society, depending upon the circumstances and willingness of the correspondent.

Vernatti's snakestone arrived in 1664 – prior to the publication of Kircher's *China illustrata* in 1667 which illuminated snakestones on the Early Modern scholarly stage. The Royal Society thus had an opportunity to operate at the forefront of academic enquiry into snakestones – however, this was only apparent with the benefit of hindsight; their field of interest was so broad that they did not consider snakestones worthy of more than cursory attention. The Royal Society's request did not include a snakestone, therefore, Vernatti himself identified it as a potential subject of interest for the Fellows, either due to his own interest in natural philosophy or his mercantile experience. The subsequent fame of snakestones vindicates Vernatti's acumen.

Vernatti's lengthy letter of 1664 was reproduced almost in full in Thomas Sprat's (1635-1713) *History of the Royal Society* (1667), demonstrating the importance of Vernatti's responses to the Society. The only omission was a personal story provided in response to a question about the herb *Datura*. The species, also known colloquially as thorn-apple or jimsonweed, belongs to the nightshade family (*Solonaceae*). It was used to treat a variety of ailments in the sixteenth century but was also reputed to be a component of witches' ointment, and its hallucinogenic properties gave rise to the legend of witches flying on broomsticks. The same properties were employed for ritualistic use, and to incapacitate the victims of crime. Early Modern authors reported that in addition

to delirium, *Datura* would render the victim suggestible, drowsy and cause memory loss, facilitating commission of the crime.

Vernatti was asked about the preparation of *Datura*, specifically whether it could be administered, lie latent, and then be activated at an appointed time. Vernatti was unable to advise but, presumably in the spirit of divulging all potentially useful information on the subject, he related a story of recreational *Datura* ingestion from his university days. This account is significant because it differs from the existing corpus in several important respects: firstly, it was of recreational ingestion, which is not otherwise attested to in the literature. Secondly, it was a first-hand account; the existing body of contemporary sources were authored by observers of those affected by *Datura*. Lastly, it was penned by a medical layperson.

Vernatti's account contains a wealth of detail regarding the symptoms of *Datura* intoxication; comparing these with modern-day assessments of *Datura* ingestion demonstrates that Vernatti was affected by the herb and suffered many of the common symptoms. It also demonstrates that during the intoxication he was afflicted by cyclopegia, which is otherwise unrecorded in seventeenth century accounts, thus Vernatti's text provides a key early record of this symptom.

<u>Snakestone bead (Pymm 2017a, 2017b, 2018)</u>

These works use published and archival evidence, including collected regional folklore, to develop a picture of how snakestone beads were perceived and used in the UK. One of their key findings is regional-specific accounts of snakestone bead generation, broadly unique to Scotland, Wales and Cornwall respectively. They also consider the magical and medical ailments that the snakestones were used to treat and establish a comprehensive picture of the snakestone beads as a feature of the local medical armoury.

The 'snakestone bead' had a particularly strong tradition in the United Kingdom. These snakestones were often annular beads formed of glass or paste, but their folklore was sufficiently flexible to accommodate items of a similar shape, such as spindle whorls, or holed stones. The origin of snakestone bead folklore is obscure. Edward Lhuyd (1660-1709), Welsh naturalist and antiquarian, penned one of the earliest extant references, theorising that they

were a surviving relic of ancient Celtic belief. He linked the snakestone bead to Pliny's *Natural History*, which indicated that snakestones were particularly valued by Gallic peoples.[96] Lhuyd's intellectual circle favoured a romanticized view of British Celtic heritage and immersion in this milieu made Lhuyd more amenable to the belief that snakestones were a vestige of earlier druidic practice that had survived.

Pymm (2018) takes the original approach of comparing and contrasting snakestone bead folklore from Scotland, Wales and Cornwall and, while acknowledging a degree of fluidity that is unconstrained by modern geographical boundaries, sets out the regional distinctions in the folklore of each. Snakestone bead folklore is particularly strong in Scotland (where there is a comparative dearth of historic druidic association). Scottish accounts tended to describe the generation of the bead by the mechanical action of snakes in one of three ways: firstly, formation of the bead from a shed snakeskin; secondly, intentional erosion of a hole through a stone by their bodies, through which they would pass leaving 'slime' upon the surface; or thirdly, concretion of 'slime' around their bodies into beads which would then slip off their tails.

Accounts from Cornwall held that the snakestone beads were formed around a hazel twig by a single snake, using its breath or spittle; whereas those from Wales indicated that the stone was formed by being 'blown' down the body of a snake by its fellows, or was worked into being from the dead body of one of their number. Pymm (2018) is the first to analyse UK snakestone legends on a regional basis and the variations identified broaden academic understanding of snakestone folklore, illustrating that the body of lore is more nuanced than previous studies have suggested.

Pymm (2017b) considers the magico-medicinal uses of the snakestone bead, exploring in detail their use against an array of ailments in Early Modern Britain. Drawing on a range of published sources and unpublished archival material, it is demonstrated that snakestone beads were used in both human and veterinary treatment and were considered lifelong useful medical items. Snakestone beads were used as an analgesic during childbirth – it is likely that the shape of the beads suggested a sympathetic connection. Particularly in Wales, snakestones were considered an excellent treatment for eye ailments,

[96] Pymm, "Snakestone Bead Folklore," 400.

likely through sympathetic association, their form suggesting a rudimentary eye. Snakestones could be used as amulets against various childhood ailments - particularly eye diseases, pertussis and teething.[97] The latter two were accounted leading causes of infant mortality, therefore a stone reputed to offer protection against them would have been held in high regard.

Although the snakestone bead was reputed to be effective against snakebite in humans, this use was not as widely attested in the sources as might be expected, in contrast to the snakestone from the head of a snake. It is likely that this was due to the comparative lack of venomous snakes in Britain. Where snakebite was treated with snakestone beads the victims were commonly livestock: the liquid in which a stone had been steeped could either be drunk or used as a wash. Alternatively, the area could be rubbed with the snakestone bead. Occasionally they were also used as prophylactic amulets.[98] In Scotland, livestock were treated with the snakestone bead for unspecified ailments, some of which were ascribed to evil spirits, witches or fairies. Treatment was rendered in the same way as described above. Snakestone beads would also be hung in the stables or about the body of an animal as an amulet to protect against infernal attack.

It was occasionally unclear as to whether snakestone beads were heavenly medical gifts and effective protections against witches, or items of witchcraft. For example, use of a snakestone bead formed part of the charges levied against Eufame Macalyne in the sixteenth century North Berwick witch trials. Snakestone beads and other such ‘charms’ were occasional targets of zealous churchmen, determined to root out pagan superstitions and practices in their flock. However, on balance they were generally viewed as having positive magic attributes, such as granting luck and prosperity, and having an apotropaic power to ward away witches and other evil spirits.

During the eighteenth century, snakestone beads gradually became conflated with hag-stones – perforated stones that were suspended in doorways or throughout a dwelling, to deter and protect against witches. Although some vestiges of belief in the magico-medicinal power of snakestone beads can still be found, from the eighteenth century they were losing their unique character.

[97] Pertussis is the formal medical term for whooping cough.
[98] A prophylactic is something intended to prevent disease.

As a result, the nuances of their generation folklore and their reputed medicinal applications were lost. This accompanied, and was a result of, the decline in ancestral beliefs and the rural way of life, in the face of advancing industrialisation.

Conclusion

The papers in this submission focus on the pharmaceutical items termed snakestones, as a vehicle through which to explore aspects of the history of medicine. Rich, although highly disparate, source material exists. Following detailed analysis, five categories of snakestone were identified. This provided a framework around which further research could be structured.

The work on dragonstones is the first wide-ranging survey on this topic. It explores the static and varying features of this snakestone from ancient to Early Modern periods. It highlights the authority of ancient texts and the gradual diversification of accounts from the thirteenth century onwards. It also explores the material culture of dragonstones. The appearance of dragonstones in vernacular works, illuminations and lavish tableware demonstrates the permeation of the medical folklore of the snakestone into broader society, as well as demonstrating a link between the history of medicine and the histories of collecting and of poisoning.

The preponderance of accounts regarding the stones supposedly sourced from the head of a serpent provided a vehicle through which aspects of pharmaceutical and medical history could be assessed. The works in this thesis present the first European-wide survey of this type of snakestone. They consider the comparative value of snakestones both in monetary terms and as a remedy in the European medical market. These considerations adopt an object-based approach, filling a gap highlighted by recent ingredient-based scholarship. These works consider the status of snakestones and other exotic *materia medica* as collection items. The role that snakestones played in society was nuanced and varied considerably according to geography and social status of the holder. The breadth of accounts, however, provided an excellent opportunity to explore the worldwide trade in pharmaceuticals; in particular, the changing cost of snakestones and the way they were conveyed across continents. The snakestone trade was marked predominantly by small-scale

transmission between individuals, rather than by large-scale trade through shipping companies. Consideration of the transmission of an individual sample from Indonesia to the Royal Society in London in the seventeenth century illuminated the way in which scientific societies sought samples for their collections and highlighted the importance of ‘weak tie’ or shallow but positive relationships in the transfer of specimens.

Consideration of snakestone-bead folklore led to the identification of regional variations in Scotland, Wales and Cornwall, a new and noteworthy development. This work expands the body of academic knowledge regarding magico-medicinal belief in Early Modern Britain. This work intersects considerably with folklore studies and the history of magic. Folklore evidence was key in establishing the pattern and nature of belief. Exploration of the ailments against which the snakestone bead was employed served to highlight and explain the value of folk remedies to their contemporary users. Snakestone beads were used apotropaically and in treatment of both natural diseases and evil affliction. Snakestones demonstrate the considerable overlap between magic and medicine that existed in the Early Modern period.

This work therefore provides a genuinely new reading of snakestones, primarily considering their role in the history of medicine and pharmacy from an object-based perspective, as well as their intersections with the history of magic, folklore studies, poisoning and collections. It provides new insights and novel conclusions which address gaps in a social history of pharmaceutical history, and the understudied area of non-herbal *materia medica*.

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4. Assessment of impact

The new and important contributions made by this work to the field are explained above. Additional metrics through which the academic impact of this work can be appreciated are as follows:

(1) Publication: acceptance of the work for publication in a range of high-status peer-reviewed journals and edited volumes by respected publishers – especially *Pharmaceutical Historian, Folklore, Pharmacy in Medicine* and the *Special Publications of the Geological Society of London*.

(2) Referencing: my publications have been cited by authors in a diverse range of fields, including medical history, contemporary medical practice, geology, natural history and archaeology (see Table 1).

(3) Online consultation of publications: those publications which are open access have been consulted hundreds of times (see Table 1).

(4) Conferences: my work was accepted for presentation at a history of medicine and pharmacy conference: “Geology and Medicine: Exploring the Historical Links and the Development of Public Health and Forensic Medicine” 2-4 November 2015. London: The Geological Society.

(5) Positive review: Pymm 2017a was singled out for praise in a published review of the volume: “The paper dedicated to ‘Serpent Stones’ gives a fascinating historical view of their medical applications delving deep into antiquity, and if you read only one paper from this publication, it should be this one” (Appendix 1).

(6) Membership of academic societies: the author is a Member of the British Society for the History of Pharmacy, and an Associate Fellow of the Royal Historical Society.

5. Acknowledgments

It is my pleasure to be able to thank my supervisor, Dr Alun Withey, for his support, input and guidance through the process of preparing this thesis for submission.

6. Appended papers

Rachael Pymm. "'Serpent Stones': Myth and Medical Application," *History of Geology Group: "Geology and Medicine: Exploring the Historical Links and the Development of Public Health and Forensic Medicine*" *2-4 November 2015*, convened by Richard T.J. Moody, Chris Duffin and Christopher Gardner-Thorpe, 27-28. London: The Geological Society, 2014.

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9. Table. Referencing, views and citations data

Citations and traffic statistics, as of 3 June 2023

	Google Scholar	Academia.edu		Researchgate.net	
	Citations	Mentions	Views	Citations	Reads
2014		6	116		622
2015a	5	1	283	4	249
2015b	1		142	2	216
2017a*	17		39	15	512
2017b*	4		20	5	62
2018*	1		19	1	47
2020a*	2	4	39		155
2020b	3	1	74	1	384
2020c*			2		2
2021	1		7	1	51

* full-text is not available online for copyright reasons

Third-party referencing works (where known):

Mozhgan M. Ardestani, Roja Rahimi, Mohammad M. Esfahani, Omar Habbal, and Mohammad Abdollahi. "Chapter 2 – The Golden Age of Medieval Islamic Toxicology." In *Toxicology in the Middle Ages and Renaissance*, edited by Philip Wexler, 11-30. London: Academic Press, 2017, https://doi.org/10.1016/B978-0-12-809554-6.00002-0. (Pymm 2017a).

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