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## **Writing knowledge, forging histories: metallurgical recipes, artisan-authors, and institutional cultures in early modern London**

### **ABSTRACT:**

This article explores a succession of goldsmiths' recipe books or books of secrets, which emerged from the early modern Royal Mint and Goldsmiths' Company. It argues that in their rich descriptions of metallurgical workshop practices, techniques and tools, these artisan-authors also narrated contested institutional histories and their own life experiences. For London's assayers (who had the responsibility of testing the precious metal content of bullion, plate and coin), authorship functioned as a status-enhancing activity. Writing treatises was a means of articulating expertise and of rooting that skilled identity beyond the self, within a much longer trajectory of institutional production and regulation.

### **KEY WORDS:**

Recipes; artisans; Tower mint; expertise; life-writing; historical culture; metallurgy.

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### **Introduction**

At the beginning of the sixteenth century, Thomas Aunsham, a self-professed 'practitioner in mint affairs', composed a manuscript on metallurgy. Aunsham hoped his text, which is full of personal experiences, recipes, and techniques from the assay workshop, would prove profitable reading for office-holders at the Royal Mint. In his words, it contained 'many proper and notable Instructions very nesenary and convenient [...] specially to those which wilbe a m[aste]r or wardene or any other minesterie within the kinge Mintes.'<sup>1</sup> Aunsham's intriguing manuscript, composed while he was deputy to comptroller of the mint, Sir Henry Wyatt, belies neat categorisation. It might variously be described as a recipe book, technical manual, book of secrets, institutional chronicle, or form of life-writing. Overall it gives a fascinating glimpse into the workshop practices, professional networks, and knowledge culture of an otherwise unknown artisan-author. Moreover, this text was evidently circulated and had an interesting legacy. Londoners engaged with Aunsham's treatise across the early modern period, as evidenced by surviving early seventeenth- and early eighteenth-century manuscripts which directly incorporate excerpts from Aunsham's original text. These later metallurgical manuscripts, focusing especially upon the skills, techniques, and recipes of the master assayer,

and the production of coin, appear to have been authored by goldsmiths and mint workers. The repetition and adaptation of recipes and techniques in these manuscripts is evidence of how articulated collective knowledge could be (re)fashioned and transmitted within institutional and civic contexts through the written medium. Fundamentally, these texts were all rooted within and shaped by institutional frameworks in London: composed, dedicated to, and preserved by employees and members of the Royal Mint and the Goldsmiths' Company.

Early modern artisanal writings, and life-writings more broadly, typically anchored individual experience and identity (so far as individuality is revealed or relevant) within broader social, professional, political, and religious networks and institutions.<sup>2</sup> Contrary to the Burckhardtian thesis - that individual subjectivity was only achieved by the shedding of medieval collective associations and consciousness - these 'elaborate networks of communal relations' have now taken centre stage in scholarly understandings of the formation of identity in the early modern era.<sup>3</sup> In an exploration of European artisan 'autobiographies', James Amelang found that 'their assumption of voice rested to a large degree on earlier experience of participation [...] in ordering their trade, neighbourhood, church, and local government'.<sup>4</sup> We see this with chronicle writing too. As Brodie Waddell suggests, 'this was *social* writing rather than 'ego-literature'. It was written about – and usually *for* – a wider community rather than the 'individualist self'.<sup>5</sup> Alexandra Walsham has written of how chronicles 'attest to the entanglement of semi-official civic and corporate remembrance with elements of what we now call individual 'subjectivity''.<sup>6</sup> In a parallel track, a rich vein of historiographical writing on early modern recipe books has stressed the intermingling of subjective experience and broader familial and community concerns.<sup>7</sup> When it came to London's goldsmiths, the subjective voice was indeed repeatedly negotiated in relation to collective institutions. These artisanal texts allow us to elucidate this in two particular ways: the assertion of skilled identities, and the entanglement of personal and corporate histories.

This article takes as its focus this network of artisanal manuscripts on metallurgy, emanating from the Royal Mint and Goldsmiths' Company, composed between the early sixteenth and early eighteenth centuries. These texts have not hitherto been subjected to sustained scholarly attention, but here they will be employed to shed new light on artisanal, institutional, and urban knowledge cultures. They also enrich our understanding of early modern practices of life-writing and engagement with historical culture. This discussion is framed around two central, interconnected research questions. Why did these skilful institutional practitioners choose to

articulate their embodied (and allegedly secret) practices through the medium of the written word? And what were their central priorities and themes when they did so?

I suggest that exploration of their authorship, content, and form is highly valuable for what it reveals about practices of early modern artisanal writing and the construction of expertise. The repeated inclusion of personal or innovative workshop procedures and methods, transnational networks of knowledge, and understanding of ancient and continental techniques, demonstrates how these institutional books of secrets, or recipe books, functioned as a form of status-enhancing life-writing for their authors. Expertise was rooted in experience and repeated trials.<sup>8</sup> Further, in authoring these treatises, assayers and goldsmiths wrote themselves into grander, legitimising narratives of corporate culture and identity. Through repeated references to particular institutional practices (such as the intensely ritualistic annual testing of coinage, known as the trial of the pyx) and historic practitioners and regulations, these metallurgical manuscripts expand and complicate our understanding of life-writing and institutional histories.

### **Technical expertise and knowledge cultures**

Assayers were a highly significant group of skilled artisans in early modern society, and were recognised as such by their contemporaries. These practitioners were responsible for testing the precious metal content of ores, bullion, coinage, and plate. The working practices and techniques of assayers such as Aunsham were thus of considerable interest to a range of urban inhabitants, including merchants and goldsmiths as well as institutional authorities at the Mint and the Goldsmiths' Company. As merchant and natural philosopher Clement Draper (c.1542-1620) wrote from his cell in the King's Bench prison, Southwark, where he was imprisoned for debt: without the practice of assay 'no man can justlye sell or buy or receive gold or silver or other metals', and no 'myne master or goldsmythe or gold fyner or gold beatter can well exersyse their artts'.<sup>9</sup> The skill of the assayer was rooted in a complex combination of technical aptitude and experiential knowledge. His evaluations of metals required the manipulation of precision tools and natural elements, specifically fire, and the interpretation of matter in states of flux. As we will see, this complicated art was said to demand the full range of sensory and critical faculties. Assay was a specialism of the goldsmiths' diverse craft, but it was not commonly practised among London goldsmiths and it was likely becoming a relatively rarefied body of occupational knowledge by the early seventeenth century. In the 1620s the Goldsmiths'

Company deemed it necessary that their official assayer ‘instruct such other members of the company ... as shall be desirous of attaining knowledge in the art of assay’.<sup>10</sup> In general, proficiency in assay must have been fostered during terms of apprenticeship and employment within the workshops of certain city goldsmiths.

The principal institutional London assay workshops from which our manuscripts originated were situated in Goldsmiths’ Hall on Foster Lane, in the heart of the city, and at the Royal Mint in the Tower, on the far eastern boundary of the city. It was at these sites that official trials were made of precious metals.<sup>11</sup> In effect, these evaluations were a judgement upon the honourable reputations of the goldsmiths and merchants who supplied the test materials, and the institutions responsible for upholding the standard. It was for this reason that the wardens of the Goldsmiths’ Company described the role of assayer as ‘a place of great trust to be supplied by men of skill and integrity’.<sup>12</sup> Those who tested the coinage were expected to act with ‘knowledges and discretions’.<sup>13</sup> Institutional positions were coveted and competitive, and particular families (such as the Brattles at the seventeenth-century Tower mint, and the Dymocks at Goldsmiths’ Hall) monopolised remunerated posts.<sup>14</sup>

In early modern England the expertise and influence of assay practitioners could stretch far beyond the physical boundaries of the capital city and its fiscal institutions. Practised assayers were, for example, actively involved in the establishment of sixteenth-century mining projects in England. In 1561, William Humfrey (c.1515-1579), a member of the Goldsmiths’ Company, was appointed assay master at the Royal Mint.<sup>15</sup> Surviving correspondence with Elizabeth I’s secretary of state, Sir William Cecil, shows Humfrey’s integral role in the incorporation of two joint-stock mining companies in 1568.<sup>16</sup> Humfrey recruited German metallurgists and investors – whom he believed had superior metallurgical knowledge and techniques – to copper mines and brass manufacture and battery in England.<sup>17</sup> During the Elizabethan gold rush of the late 1570s, stimulated by Martin Frobisher’s North-West Passage expeditions, assayers were understood to be absolutely crucial participants – in the metropolis, in Dartford, and on site in north-east Canada – in ascertaining legitimate gold (though as it so happened, results were inconclusive, and there was no consensus among these practitioners).<sup>18</sup> More broadly, against the backdrop of seventeenth- and early eighteenth-century imperial expansion and trade, particularly in the gold-rich regions of West Africa, the metrological work of assayers also contributed to imperial attempts at standardisation in trade and commerce.<sup>19</sup>

Little contextual detail can be discerned about Thomas Aunsham, his employment at the Royal Mint, and the production of his early sixteenth-century metallurgical manuscript. Aunsham served as deputy to the comptroller and assay-master Sir Henry Wyatt, giving ‘daily attendance’ at the mint from c.1509 to c.1520, and between these dates Aunsham regularly presented the comptroller’s accounts to the Exchequer.<sup>20</sup> The comptroller was responsible for exercising ‘a check on behalf of the Crown on the accounts of the [mint] master, and more particularly to make each year under oath a comptrolment roll of all bullion melted and all money coined, arranged by month’.<sup>21</sup> As is discussed below, in his manuscript Aunsham locates himself within a broad European network of institutional expertise, and he explicitly mentions that he received training abroad. Since Aunsham specifically notes that his manuscript might be instructive for ‘those which wilbe a m[aste]r or wardene or any other minesterie within the kinge Mintes’, we might reasonably conjecture that he sought professional advantage or patronage of some description.<sup>22</sup> Senior officer-holders at the Tower mint (such as the aforementioned Sir Henry Wyatt) were frequently of high social rank but sometimes lacked the practical skills necessary for the production and testing of coin.<sup>23</sup> Aunsham’s original manuscript does not survive (or, at least, has not yet been identified or recovered), and in this discussion I refer to a seventeenth-century copy of Aunsham’s manuscript, located in the Harley collection of the British Library.

Rather more circumstantial detail can be provided for the second key manuscript under scrutiny here: an early seventeenth-century text entitled *The Gouldesmythes’ Storehowse. Wherein is layde up many hidden secrets of that Ingenious Misterie*. The manuscript was ‘compiled, made, and drawen into this Method by H-G. Citizen and Gouldsmythe of London’, and is dated 1604, or 1606, depending upon the particular version. It is very likely that this text was a work of collaboration between a father and son – both named Hannibal Gamon, and both of the Goldsmiths’ Company. Notably, the authors of *The Gouldesmythes’ Storehowse* had evidently read Aunsham’s metallurgical manuscript, as extracts from the earlier recipe book are included in the Gamons’ book of secrets. There are two manuscript versions of *The Gouldesmythes’ Storehowse*, and five known copies.<sup>24</sup> I consider both versions here, but my main focus is upon a copy held in the Goldsmiths’ Hall Library.<sup>25</sup> This manuscript consists of eighty-three quarto leaves and is divided into three books, containing numerous short chapters. Thematically, the overall emphasis of the text is on the practices of assaying, refining, and monetary circulation. It also considers the social and institutional structure of the Mint, translations of late-medieval lapidaries, and alchemical experiments and formulas.

In June 1606 the Goldsmiths' Company was presented with a manuscript authored by the younger Hannibal Gamon, who was said to have 'taken greate paines in translat[i]on'.<sup>26</sup> This text was almost certainly *The Gouldesmythes' Storehowse*. Hannibal Gamon the younger (bap. 1582), graduated from Broadgates Hall, Oxford with a BA degree in 1603, and an MA in 1606.<sup>27</sup> He had been a company exhibitor at Broadgates. In 1603 the company presented him with five pounds 'toward his grace in the universitie and the charges of his com[m]encement', and on receipt of the manuscript in 1606, the guild gave him ten pounds towards his commencement 'to be Master of artes'.<sup>28</sup> The elder Hannibal Gamon was a working goldsmith, with a workshop on Cheapside. He gained his freedom from the Goldsmiths' Company in 1575. Another of his sons, Henry Gamon, gained his freedom from the guild through apprenticeship in 1604, and a grandson, Richard Gamon, gained his freedom through patrimony in 1626.<sup>29</sup>

The third institutional text under consideration here is entitled *Mint and Moneta* (Mint and Money). This manuscript is from the archive of the Royal Mint, and nothing is known of the manuscript's author or the exact circumstances of its production. *Mint and Moneta* has been dated by archivists to the first decade of the eighteenth century.<sup>30</sup> Certainly, in the years immediately following the Great Recoinage (1696), a discussion of the skill and precision involved in metallurgical testing would have been especially opportune.<sup>31</sup> The manuscript is divided into two books, consisting of multiple short chapters. The first explores the subject of weights and the production and testing of coin and is, essentially, a copy of an anonymous sixteenth-century treatise.<sup>32</sup> The second is, in effect, a concise history of the Royal Mint. The intricacy of descriptions of workshop practices is suggestive of an author who was either undertaking these processes himself, or, at the very least, a close observer. It is apparent that the author of *Mint and Moneta* had also read a copy of *The Gouldesmythes' Storehowse*, as several passages are copied verbatim. Though these texts were clearly subject to scrutiny by later generations, *Mint and Moneta*, like the *Storehowse*, was evidently a presentational copy. Frustratingly, we lack reader traces on the texts themselves; these manuscripts do not bear any obvious signs of use, or later annotations in changed hands.

The borrowing, copying, editing, and embellishment of recipes, techniques, and phrases evident throughout this network of metallurgical manuscripts should not surprise us. Authorship was predominantly a collaborative exercise in the early modern period.<sup>33</sup> As Julia

Crick and Alexandra Walsham write, ‘the copying of texts [in the sixteenth and seventeenth centuries] is increasingly seen as “an adventure in supplementation rather than faithful imitation”, a dynamic, open-ended process in which consumers merge with producers’.<sup>34</sup> Recipe texts, a highly creative medium in which methods and substances could be adapted with such ease according to personal preference and experience, were especially fertile vehicles for collaborative authorship.<sup>35</sup> We will see how our assay and goldsmith authors collated secrets and recipes from various sources to construct compilations of useful knowledge on metallurgy, and in order to demonstrate social and institutional networks. And yet, explicit modifications of inherited recipes could also be a means of asserting personal expertise and perhaps identity.

### **Why write a technical treatise?**

Early modern Europe witnessed a veritable flood of writings on craft workshop processes and techniques. These manuscripts and printed texts focused on practices as varied as dyeing, sausage production, shipbuilding, and medicine manufacture. Many craft-themed or technical ‘how-to’ treatises took the form of books of secrets or recipes. Their authors promised that secrets of the arts, formerly concealed within artisanal workshops, would be revealed to enthusiastic readers.<sup>36</sup> Typically, these recipes included lists of ingredients, ideal workshop conditions (such as climate and temperature), tools, and methods. Often multiple recipes would be given for the same process. For instance, Thomas Aunsham’s early sixteenth-century text lists dozens of different techniques and ingredients for carrying out cementation.<sup>37</sup> One such recipe – for the purposes of giving ‘a right good collour’ to gold – gives a flavour of such formulae. The practitioner was required to ‘take an earbe [herb] that is called Cokoos [cukoo’s] pintle [...] when it is ripe which is about Michaelmas then it beareth the Redd berryes and growth by the Rivere side in wild hedges, it being stamped and strained or distilled, and quench yo[u]r goulde in [...] the water distilled therof and it wilbe faire’.<sup>38</sup> As this example suggests, there were often few firm distinctions between recipes which we might otherwise categorise as being from craft, household, or medicinal traditions.

Across sixteenth-century Europe a number of assay and mining practitioners, as well as humanist scholars (in dialogue with artisans), authored manuscripts and printed treatises. These texts revealed significant details about metallurgical techniques (such as cementation and the separation of metals), tools (particularly balances and furnaces), and working practices. Against the background of the major European mining boom (c. 1450-c.1550), these works



proved instructive for ruling elites, potential investors and perhaps practitioners (involved in prospecting, mining, processing, and testing metals).<sup>39</sup> Such texts also did much to raise the status of metallurgy, by presenting it as a coherent body of knowledge.<sup>40</sup> The manuscripts on metallurgy and coinage which are the focus of this article were certainly part of this broader culture of technical authorship. Indeed, the authors of the early seventeenth-century *Gouldesmythes' Storehowse* and the later Mint manuscript were self-consciously in dialogue with well-known metallurgical authorities. These artisan-authors were 'hybrid experts [...] borrowing skill, language, and explanations from both artisanal and the scholarly worlds'.<sup>41</sup> In their descriptions of particular historic regulations, ritual practices (such as the trial of the pyx), and hierarchies of mint officials, these manuscripts were also very distinctively a product of early modern London and its institutions.

But writing (or indeed speaking) about the coinage could be a contentious and risky business in the sixteenth and seventeenth centuries. The intimate association of coin with royal sovereignty – its very extrinsic value derived from the stamp of the monarch – meant that critiques of the coinage slipped easily into the category of seditious and treasonous behaviour.<sup>42</sup> Across Britain and Europe, this was an era in which 'coinage was regarded as a crucial state secret, and the ability to handle and keep secrets was therefore indispensable'.<sup>43</sup> Sensitivities on the part of English royal and institutional elites concerning the discussion of bullion, coin, and procedures for their regulation were especially heightened following the mid-sixteenth century monetary debasements. At the start of the century the London mint had a strong reputation: 'no Continental silver currency approached the purity of sterling'.<sup>44</sup> And yet, as a consequence of the royal policy of monetary debasements the intrinsic value of coins was vastly reduced and public confidence in the value of currency sharply undermined.<sup>45</sup>

This particular context makes these manuscripts on metallurgy and the coinage, coming from within the Royal Mint itself, even harder to fathom. And yet, we should bear in mind that these treatises were addressed to institutional authorities at the Mint and Goldsmiths' Hall, and probably intended to be circulated within a group of trusted intimates. As Elaine Leong and Alisha Ranking suggest, 'building communities of knowers was one of the most crucial functions of secrets'.<sup>46</sup> Besides, books of secrets did not fully reveal the technique under scrutiny; rather, 'such books often described secrets only vaguely, so that more was hinted at than revealed'.<sup>47</sup> Moreover, non-discursive practices cannot truly be revealed in their entirety through words. Craft processes are ultimately learned by close observation and doing.<sup>48</sup> Indeed,

Thomas Aunsham himself, and later goldsmith authors who borrowed from and adapted his text, stressed the primacy of ‘experience of profe and of exercise’ in developing the ‘full expert’.<sup>49</sup>

Further, it would be mistaken simply to view recipe books as intended for the communication of a precise body of technical knowledge. Broader research on early modern medicinal and food recipes has suggestively expanded our understandings of the social, intellectual, and emotional work of recipe collections. Women’s recipes, in particular, can be read as compelling forms of self-articulation. Catherine Field has spoken of recipe books as ‘a textual space that enabled women’s positive expression of the self’.<sup>50</sup> In the words of Sara Pennell and Michelle DiMeo, ‘recipe books can represent life-writing, or perhaps [...] life-registers’.<sup>51</sup> For the English gentry, the production of household recipe books ‘has as much to do with recording a family’s connections as with gathering recipe knowledge’.<sup>52</sup> We might thus see recipes and their production as part of a much ‘larger network of life-writing texts’ and social practices, including account books, commonplace books, and annotated family Bibles.<sup>53</sup>

The authors of these London-based manuscripts on assaying and coinage did not specifically state their rationale for writing, and ultimately there can be no single explanation for why numerous craft practitioners chose to translate fundamentally oral and embodied processes through the medium of the written word. However, we can make some reasonable assumptions about their motivations based upon the broader contexts of artisanal writing in the early modern period and their particular textual dedications, and, principally, the central themes of discussion. We find that establishing expertise and status, or, in other words, articulating a sense of (expert) identity, was one of the primary drivers for authorship. Composition of these recipe books was also a means of constructing institutional histories, and a way of inserting practitioner-authors within these larger historic narratives of metallurgical expertise and oversight.

### **Artisanal writing and the construction of expertise**

Expertise is a central theme to emerge from this network of metallurgical manuscripts. As a subject for discussion, the authors dwell considerably upon the acquisition and development of expert skill or ‘mastery’. Moreover, it is evident that the very act of authorship was also motivated, in part, as a means of demonstrating subjective expertise. Throughout his early

sixteenth-century treatise, Thomas Aunsham repeatedly returns to the theme of the general skills and personal qualities required for undertaking effective metallurgical workshop activities. Overall, this mint worker stresses the significance of direct repeated experience in carrying out assay. This was not a workshop technique that could be grasped rapidly, even if demonstrated by an acknowledged expert. Mastery required repeated trial and error. Aunsham wrote that:

there is no man that can do this by the te[a]ching of any man but onely by experience of prooffe and of exercise, notwithstanding he may fail some tymes in this reconinge that doth make him full expert and cunnyng therin; But with good taking heed thereunto, the very truth shalbe knowne unto him.<sup>54</sup>

Making errors and failed trials were thus all part of the learning process.<sup>55</sup>

A century later in their *Storehowse*, the goldsmith Gamons also emphasised the importance of repeated experience. They wrote of ‘a p[er]fit Assaye man, whose p[er]fection must be grounded upon Artificiall Exercise; for these things doe rather consist in doinge, then in Resoninge, for they are not eselie reduced to matter of Argument, unlesse Exercise be joynd w[i]th speche’. Elsewhere in the manuscript it is said that assay trials ‘askethe a good Judgement, gotten rather by yeares and experience, then by speculation and dispute’.<sup>56</sup> This emphasis upon accumulated workshop experience was also articulated by the foremost sixteenth-century metallurgical authorities. For example, the German metallurgist Lazarus Ercker stressed that knowledge and true understanding of metallurgy, ‘without great diligence and daily Practise cannot be known’. He presented his treatise as ‘a furtherance to Experience’.<sup>57</sup>

For Thomas Aunsham, an essential element of lived experience was the cultivation of attuned visual perception.<sup>58</sup> In a description of ‘the most assured way’ of parting gold from silver using aqua fortis he recommended that practitioners pay close attention to the colour and consistency of the boiling mixture. He wrote how the artisan should undertake the boiling process ‘untyll that yo[u]r water be all charged w[i]th silver, and that shall ye knowe by the clearenes and greeness of yo[u]r said watere’. Alternatively, if the parting process had not been successful ‘ye shall p[er]ceave by the blackness of that watter which you shall see in the bottom of yo[u]r glasse’. Elsewhere, in a description of heating gold, Aunsham writes ‘that ye see that it is faire

and bright above'.<sup>59</sup> Writing a century later the goldsmith Gamons explicitly stressed the multi-sensory nature of workshop production. It is said that 'besydes his grownded experience in this scyence or mysterye [the assayer] should have a perfit eie to vewe [or 'discerne'], and as stedye a hande to waye [weigh] for other mens senses cannot serve him'.<sup>60</sup> In a description of testing precious metals with acid, *The Gouldesmythes' Storehowse* also speaks of the significance of aural comprehension: 'to have surer knowledge therof laye your eare unto the saide glasse and yf it be full laden and charged w[i]th sylver it will sounde in this wise. bott, bott, bott'.<sup>61</sup>

The application of appropriate force in carrying out workshop tasks is another consistent theme in the early sixteenth-century manuscript. Cultivation of the artisanal expert necessitated a growing awareness that different metallurgical recipes and trials required varied levels of strength. For example, the parting of gold from silver using aqua fortis required the practitioner to 'poure softely'. Likewise, a Portuguese recipe for cementation required the artisan to 'washe out yo[u]r said cemente softely by little and litle'.<sup>62</sup> 'Softly' connoted the undertaking of an activity gently, carefully, in an unrushed manner.<sup>63</sup> By contrast, 'a meetly strength' – meaning moderate force – was needed for other techniques. Another recipe for cement necessitated that one 'wringe out the moystenes therof very harde betweene yo[u]r handes'.<sup>64</sup> Instructions for making gold more malleable recommended that in managing the fire an artisan 'blowe therunto right sore [with great exertion or effort] untyll it have a convenyent heate w[hi]ch will cause it to drive and worke'. Calculating timings – for example, for how long to heat a solution – was also a crucial learned activity. Aunsham recommended that a practitioner pace his work 'by the space of an avemary'.<sup>65</sup>

Though his precise motivations for writing are not stated, it is reasonable to assume – from repeated references to his own skill and experience in metallurgical techniques and procedures – that Thomas Aunsham's Mint manuscript was composed in part to demonstrate and record his extensive personal expertise. In doing so he presumably hoped to capture the attention and favour of those mint officials – 'master or warden' – whom he addressed at the opening of the treatise.<sup>66</sup> Experiential learning – knowledge derived from experience – is presented as the root of Aunsham's mastery of workshop practices. Numerous recipes and methods for refining precious metals and separating gold and silver from base metals are described as having been 'proved trewe pe[r] me Thomas Aunsame'.<sup>67</sup> For example, a recipe for the making of aqua fortis (nitric acid) for the assay of gold using only 'fine salte peeter of the best' is described as one 'that will make yo[u]r Gould perfecte fyne and better then is yo[u]r noble [gold coin] of

England, proved trewe by Thomas Aunsam.’ Likewise, regarding a recipe for ‘a right good collour to be given to goulde’ – which involved a sprinkle of water, ‘a small powder of sall Armonacke [sal ammoniac]’ and the application of heat – Aunsham comments: ‘this have I proved true’.<sup>68</sup> To ‘prove’ in early sixteenth-century England meant to demonstrate, test, or make trial of.<sup>69</sup> This language of proof was also used extensively in early modern medicinal and food recipes, in manuscript and print. The use of the phrase ‘proved trewe’ could thus indicate an experiential understanding of craft processes.<sup>70</sup> It also emphasised the individual tester’s identity and discretion in undertaking these workshop-based endeavours.<sup>71</sup> Expertise is further asserted by Aunsham through interventions in recipes passed on by other artisans which were trialled at the Tower mint and found wanting. We see this form of mediation in a formula for ‘another cement to affine w[i]th any man[n]er of gould at xii hours as John Leonard & also Jacob Uncerleming of An[t]werpe useth’. Aunsham interjects – ‘but I hould the opinione that ye muste have 24 houres at the leaste or else yo[u]r gould will not be perfecte fyne [...] this manner of cementynge is good for him that hath haste but it is nothings so profytable as is the longer’.<sup>72</sup>

Mastery of mint processes is also implied through Aunsham’s locating his accumulated metallurgical knowledge and techniques within a broader European institutional network. His training in the craft – perhaps as an apprentice and journeyman – is said to have taken place abroad, in continental Europe. He speaks of ‘ye mr and wardnes of the mints beyond the sea w[i]th whom I was brought up and Learned’. Throughout the early sixteenth-century manuscript, recipes and techniques from European workshops originating from both named and anonymous mint workers are shared, such as (the aforementioned) ‘Jacob Uncerlenning of Anwerpe’, and practitioners ‘at Lisbon and in Portugall’. Observations and recommendations for the refining and assay of precious metals are supported by the assurance that this is ‘as farre as I Thomas Aunsham marchant can practis or knowe by any other minte masteres of strange Countryes’.<sup>73</sup> Aunsham repeatedly implies that he has personally witnessed a wide variety of practices, using phrases such as ‘I never knewe nor harde of any master that [...]’, or, ‘I have seene diveres myntemasters that [...]’.<sup>74</sup> As the historian of science Elaine Leong has argued, early modern household (medical and culinary) recipe books could act both as ‘repositories of household knowledge’ and as ‘maps of a family’s social network’.<sup>75</sup> In a similar vein we might see Aunsham’s text both as a storehouse of useful metallurgical recipes and techniques, and as a (self-aggrandising) plot of his professional and institutional transnational networks. If we understand the authorship of this text as, in part, a tool for garnering potential promotion from

his institutional and court patrons, then the advertisement of such networks might have proved a fruitful strategy.<sup>76</sup>

### **Recipe books as institutional histories**

So far, we have seen how these metallurgical recipes, or books of secrets, could work to establish the mastery, reputations, and professional networks of their authors. A close reading of these texts also suggests that they were a reflection upon institutional and practitioner histories. To modern ears, this might sound like a surprising discovery. We do not expect to find historical culture in and amongst directions for stirring pots and controlling furnace temperatures. And yet, during the sixteenth and seventeenth centuries recipes and histories could be closely entwined. In an age of obsessive genealogists, household recipe books were used as devices for recording and passing on family histories.<sup>77</sup> In a parallel vein these metallurgical recipes directly engaged with (often contested) institutional histories. They passed on historical accounts of workshop regulations, techniques, and trials to broader artisanal and mercantile communities. And thus, while their authors were small cogs in complex corporate machines, they nevertheless helped to shape the outlines of institutional identity.<sup>78</sup> Moreover, if we consider the assay and coinage manuscripts here as a collection of texts, we find that this historical theme gets stronger over time. From a smattering of historical references in the early sixteenth-century Aunsham manuscript, recent history looms large in the early seventeenth-century *Gouldesmyths Storehowse*; a century later, *Mint and Moneta* dedicates an entire volume to chronicling the history of the Royal Mint.

Thomas Aunsham engages with institutional histories on a number of levels, both vague and highly specific. He makes elusive references to past metallurgical practices and masters at the Tower mint. For instance, toward the opening of his text, and in a decidedly self-aggrandising tone, he speaks of how ‘the masters then had no p[er]fecte sight or knowledge of partyng or makynge of assaye by water for that is best and moste sureste as hereafter more playnly is written.’<sup>79</sup> The non-specific past is employed here as a foil for a more innovative present moment. But this Mint official also makes note of specific historic ordinances and personnel of the mint dating from the reigns of Edward III, Richard II, and Henry VI, ‘keeping as it is inrolement [recorded] in the Kings Exchequer’. For example, Aunsham writes of how ‘the master of the mynte is not charged to receave no silver but after the verye valewe of the alloye, as by the assaye there upon dulye made [...] declared by a statute thereupon made the ii yeare

of kynge henry the vi.’ Elsewhere he speaks of ‘the verie knowledge how much the merchants had of gould and silver [...] in the Reigne of King Edward the fourthe, Hughe Brice then being deputie [of the mint]’.<sup>80</sup> Aunsham looks to have consulted specific archival documents in the Exchequer. As part of a discussion on the legal checks on the master of the Tower mint, he makes reference to ‘the Indenture made betweene the kynge and them as appeareth in the booke caled *Domus Dei* and in the Redd book in the kinges exchequer’.<sup>81</sup> Such archival investigations would have been relatively convenient for Aunsham: Exchequer archives were located in the Tower in his day. Here we have a relatively minor Mint official conducting research, strengthening the historical roots of collective corporate identities.

In the *Gouldsmythes Storehowse*, authored at the turn of the seventeenth century, recent institutional history features heavily. References are frequently made to historic office-holders, tools, and practices. As with Aunsham’s text, some of these allusions are very general, such as the comment that ‘this is a w[eigh]t which hath beene used in England from ye beginning in the Kinges Myntes, till of late yeares’. Other historically themed entries are highly specific – for instance the performance and results of particular metallurgical trials.<sup>82</sup> Moreover, in their strategic recording of certain events and practices at the Royal Mint, the goldsmith Gamons bring together a range of written, printed, and oral media. In other words, their *Storehowse* of goldsmiths’ knowledge makes use of manuscript evidence, published sources, and their own personal first-hand experience.

In writing a compendium of useful knowledge possessed by goldsmiths, the Gamons borrowed liberally from historic manuscripts authored by London mint workers. An account in the *Storehowse* of ‘what money is made of’ is in places verbatim to that contained within the late thirteenth-century *Treatise on the new money*.<sup>83</sup> The author of the *Treatise* recognised that although the making of money and the process of assay ‘is regarded as difficult and intricate, I propose, so far as my poor wits serve me, to explain it briefly in writing’.<sup>84</sup> The Gamons demonstrated an even more intimate knowledge of the working of the Mint, and the institutional archive, in their precisely worded description of an indenture of 1583 between Elizabeth I and goldsmith Sir Richard Martin, ‘then master worker of her monyes, and warden’.<sup>85</sup> This indenture concerned the exact definition of the sterling standard and was thus a highly politically charged reference. The debate over the sterling standard raged fiercely between 1583 and 1587, ‘with great vigour both in practical demonstrations of assaying skills and in verbal memoranda’ – with Martin at its centre.<sup>86</sup>

Beyond London archives, the goldsmith authors of the early seventeenth-century treatise went to great pains to emphasise the breadth of their reading on the practice and history of metallurgy. This is achieved through dozens of intertextual references to ancient and early modern works, both ubiquitous and rare, on coinage, assaying, mining, alchemy, and gems. In a brief chapter on the production of coin, for instance, the Gamons reference the Dutch mint warden Renerus Budelius (and his book *De monetis et re numaria* (1591)), Johannes Aquilus, and Aristototele's *Ethics*. On the trial of gold and silver 'by the eie upon the Touchstone' and 'the excellencie of that skylle, ther bye to be attayned' the goldsmiths write that: 'I have red in Budelius, whoe shewethe the makinge of those nedels [...] that plinie commendethe this triall of the nedels upon the Touchstone, in his 8 chap of his 33 booke'. Overall, the Gamons stressed that such reading and historical context was a requirement for full mastery in the goldsmiths' trade. In their words: 'the marchant goldesmyth', by which they meant those who traded as well as crafted, must have skill and knowledge, in all these aforesaid severall knowledges. Or els he cannot be esteemed in this function a perfitt Artiste. All w[hi]ch cannot in manye yeares be attained unto onlye by Tradition; unless lernninge, which is gotton by Reading several Authors, be joyned therto.'<sup>87</sup>

First-hand witnessing and participation in recent trials were also recorded by the Gamons in their metallurgical manuscript and knitted into a historical narrative of regulation and scrutiny. An intriguing passage in the *Storehowse* recounts 'the Trewe Discourse' of two specific pyx trials undertaken in Star Chamber at the (old) Palace of Westminster. Significantly, these are told from a first-person perspective, the only passages in the manuscript that depart from an 'objective' third-person narrative voice. Hannibal Gamon senior served on the specialist jury, composed of fifteen 'ancient and skilfullest goldsmythes' in April 1600 and May 1601.<sup>88</sup> He relates particular circumstantial detail of a trial that did not go precisely to plan:

This tryall being thus made, and finding the furnace for want of use not agreeable to o[u]r likinge by reason so manye assayes being made, and none agreed w[i]th our Tryall peace we dined, and after dynner desired longer respite w[hi]ch the lords granted, and so we departed, to make farther Tryall at the goldesmythes Hale [on Foster Lane], w[hi]ch we did as followethe.<sup>89</sup>



This intriguing passage recounting personal participation in recent historical trials certainly reaffirms the importance of experience as a central element of expertise. The account of Gamon's direct involvement in the pyx ritual also inserts these goldsmith-authors directly into significant (and secretive) institutional histories.

The entire second volume of *Mint and Moneta* – following a first book of recipes – is dedicated to the history of coinage and the Tower mint. Here the focus is not upon personal involvement in particular trials. Instead, the author/compiler provides a much broader and chronologically coherent overview of key moments and controversies in the history of the institution. Beginning with the establishment of the Royal Mint, the author details such matters as ‘a course taken [...] for the p[re]vention of counterfeiting’, the fees paid to the officers of the Mint in the reign of Edward VI, ‘an abridgement of a treatise concerning an undervaluation of gold and silver in England, which is proved to have been hurtfull to our state’, and ‘the opinion of certain merchants to prevent the transportation of gold and silver forth from the Realm c.1608’.<sup>90</sup> This early eighteenth-century narrative is quite explicitly an historical account, and it would have perhaps appealed to office holders at the institution. Knowledge of such weighty past controversies, such as the shortage of money problem, must have been especially valuable in the years directly following the 1696 Great Recoinage, when public trust in the paper currency, and the silver coin backing the notes, was so crucial.<sup>91</sup> More broadly, this historical coinage theme might have appealed to gentlemanly educated readers in general. As Daniel Woolfe has noted, by the early 1600s ‘knowledge of coins was rapidly becoming an indispensable part of the study of history proper’.<sup>92</sup>

There can be no simple explanation for these reflections on past practice. Motivations for authoring histories, and indeed engagement with historical culture much more broadly, were highly various in early modern society.<sup>93</sup> Nevertheless, two central features seem especially pertinent for the authors of these metallurgical treatises. First, in their discussions of history in a generalised institutional sense, a legitimising element appears to have been at play. As discussed previously, the subject of coinage, and its rigorous and state-controlled testing, was contentious and political. Reflection upon past institutional practice or ordinance could have been a useful means of justifying - or indeed criticising aspects of - the contemporary institutional regime. Writing about the past could be a strategy for reassuring readers that quality control of bullion and specie was being overseen by highly skilled experts. This was especially pertinent following the repeated debasements of the coinage at the Tower mint

during the sixteenth century. Second, histories were employed in a more subjective sense to yolk the individual practitioner-expert to *longue durée* institutional narratives, thus bolstering social and professional identities.

In the vein of utilising history to underwrite the validity of the contemporary institutional regime, we have an intriguing and highly relevant case-study, whose author engaged with the past precisely for such (self) legitimising purposes. The aforementioned goldsmith Sir Richard Martin made his partisan ends absolutely explicit in his treatise on the Royal Mint (1603), which was directly addressed to the newly crowned James I.<sup>94</sup> In holding the official positions of both master worker and warden concurrently (from 1582 to 1599), Martin dominated the late sixteenth-century Mint. As Simon Wortham writes, ‘the mint had essentially been in the hands of a single man [...] whose responsibilities covered the entire process of making, checking, and accounting for the coin produced, including appointing a jury of experienced goldsmiths to assay newly minted coins’.<sup>95</sup> Additionally, Martin was an exceptionally influential figure within the Goldsmiths’ Company; he served as prime warden four times, and took at least forty apprentices. In 1589, the same year that he was knighted, Martin served as lord mayor of London. However, Martin’s personal and political fortunes changed rather drastically when he was declared bankrupt in 1602, degraded from the court of aldermen and imprisoned. As an additional sting in the tail, he was engaged in a serious and highly defamatory debate with Thomas Knyvet at the Mint, who had taken over the wardenship in 1599.<sup>96</sup> Knyvet claimed that Martin owed the crown a huge sum, in the region of eight thousand pounds, ‘for bullion delivered to the master-worker but not redelivered in coin.’<sup>97</sup> In his treatise, Martin unequivocally claimed to write ‘for the advancement of your majesties service there [the Tower mint], that thinges partlie now out of frame, and swarvinge from the annient lawes, and customes of the mynt, may be drawn backe againe to their old and pristine forme and rule’. Elsewhere, Martin referred to the ‘indentures being the lawes and constiutions of the said mynt and even as the load stare by which all the officers of the said mynt ar[e] to dyrect their course.’<sup>98</sup>

In the process of justifying his own actions as master worker of the Mint, and severely critiquing the professional behaviour of the warden, Martin recalled specific historic statutes and regulations (right down to precise manuscript leaves). Further bolstering the significance of historic references, in a copy of Martin’s treatise held at Senate House Library Archives several manicules have been added in the margins (by Richard Martin, or a later reader),

highlighting specific historical ordinances; these are the only textual marginalia.<sup>99</sup> For instance, a manicule draws attention to ‘the Red booke’ in a discussion of the responsibilities of the warden of the Mint. Martin writes that to this official ‘ought to belong the knowledge and skill of assaying and tryeng of the Bullion and moneys [...] If the warden know not this (as the record of the Red booke saithe which is the originall ground of the lawes of all myntes [...] he ought to have in his place some one skilfull artsman, educated and bread in that science’.<sup>100</sup> Martin explicitly reflected upon past practice as a way to counteract what he perceived as subversive institutional change.

## **Conclusion**

Close scrutiny of this small collection of metallurgical manuscripts composed by London’s sixteenth- and seventeenth-century assayers suggests that authorship was a means of articulating expertise and of rooting that skilled identity beyond the self, within a much longer trajectory of institutional production and regulation. This was likely a strategy aimed at legitimising corporate practices, but the marked historical leitmotif might also have served a subjective purpose: namely, authoring a treatise with a historical slant enabled these artisanal workers and officials to weave their relatively humble professional lives and successes into grander narratives of corporate history. In these recipe books we see flashes of ‘subjectivity’, as when Thomas Aunsham reflects upon his training, critiques outmoded ways of doing things, and corrects received recipe wisdom. Likewise, the subjective artisanal expert comes to the fore when goldsmith Hannibal Gamon Snr. recounts his experiences of a pyx trial which did not go exactly to plan. The past could be employed to legitimise the institution in general, but in doing so goldsmith-authors also engaged in practices of self-promoting life-writing.

Analysis of this network of metallurgical manuscripts has implications too for our understanding of urban sites of knowledge production and exchange. We typically think of recipes as being passed down the generations in the domestic context or particular household-workshop, and much recent scholarship has suggestively framed the household as a significant site of knowledge production and dissemination.<sup>101</sup> However, here we have encountered rather different urban environments in which recipes, and their associated skills and knowledge, were copied, revised, and perpetuated. These artisan-authors wrote from within the Tower mint and the Goldsmiths’ Company. Their accounts of testing and material regulation are located within these sites. The dedications of their treatises further imply that they anticipated readers from

within these institutional circles. This corporate context for manuscript production clearly has implications for how we conceive of the purposes and nature of these London institutions: these were dynamic sites of (knowledge) production and exchange.

9461 words (including notes).

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<sup>1</sup> BL Harley MS 38, fo. 237r.

<sup>2</sup> Alan Stewart, 'Introduction', in *The Oxford History of Life-Writing, Volume 2, Early Modern* (Oxford, 2018), p. 9.

<sup>3</sup> Hannah Wojciehowski, *Group Identity in the Renaissance World* (New York, 2011), p. 9. See also Gervase Rosser, *The Art of Solidarity in the Middle Ages: Guilds in England 1250-1550* (Oxford: Oxford University Press, 2015).

<sup>4</sup> James S. Amelang, *The Flight of Icarus: Artisan Autobiography in Early Modern Europe* (Stanford, Calif.: Stanford University Press, 1998), p. 229.

<sup>5</sup> Brodie Waddell, 'Writing history from below: chronicling and record-keeping in early modern England', *History Workshop Journal*, 85 (2018), pp. 239-264, at p. 241.

<sup>6</sup> Alexandra Walsham, 'Chronicles, memory and autobiography in Reformation England', *Memory Studies*, 11 (2018), pp. 36-50, at p. 46.

<sup>7</sup> Catherine Field, "'Many hands hands": writing the self in early modern women's recipe books', in Michelle M. Dowd and Julie A. Eckerle, eds., *Genre and Women's Life Writing in Early Modern England* (Aldershot, 2007), pp. 49-64; Elaine Leong, *Recipes and Everyday Knowledge: Medicine, Science, and the Household in Early Modern England* (Chicago; London, 2018).

<sup>8</sup> I have chosen to use the noun 'expertise' in this article, though I am aware that the word would not have been recognised by the authors of these texts. To my mind there is no effective alternative which encapsulates the particular blend of practical, experiential, and theoretical knowledge, institutional contexts, and active process of status enhancement which these texts capture and represent. In deciding whether to employ the term I found the following discussion helpful: Eric H. Ash, 'By any other name: early modern expertise and the problem of anachronism', *History and Technology*, 35:1 (2019), 3-30.

<sup>9</sup> BL Sloane MS 1423. And for a broader discussion of Clement Draper and his writings and experimental practices, see Deborah E. Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven, CT: Yale University Press, 2007), Ch. 5.

<sup>10</sup> Walter Sherburne Prideaux (ed.), *Memorials of the Goldsmiths' Company*, 2 vols. (London, 1896-97), vol. 1, p. 140.

<sup>11</sup> For these workshops as significant sites of experimental knowledge in the early modern metropolis, see Jasmine Kilburn-Toppin, "'A place of great trust to be supplied by men of skill and integrity": assayers and knowledge cultures in late sixteenth-and seventeenth-century London', *The British Journal for the History of Science*, 52: 2 (2019), pp. 197-223.

<sup>12</sup> Goldsmiths' Hall Archive, London (GHA), Wardens accounts and court minutes (WA/CM), P2, fo. 15v.

<sup>13</sup> GHA, MS C II.2.1, fo. 27v.

<sup>14</sup> Kilburn-Toppin, "'A place of great trust to be supplied by men of skill and integrity", pp. 11-12.

<sup>15</sup> Kiernan, David. "Humphrey, William (c. 1515-1579), mining promoter and assayer." Oxford Dictionary of National Biography. 23 Sep. 2004; Accessed 10 Sep. 2020.

<https://www.oxforddnb.com/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-47479>.

<sup>16</sup> BL Lansdowne MS 6, fos 39r-41r, MS 18, fos 103r-106r.

<sup>17</sup> Eric Ash, *Power, Knowledge and Expertise in Elizabethan England* (Baltimore; London, 2004), Ch. 1; Harkness, *The Jewel House*, Ch. 4, esp. pp. 149-150, 170-173. Ash presents a much more pessimistic picture of these ventures and 'expert' management than Harkness.

<sup>18</sup> Donald D. Hogarth, 'Mining and metallurgy of the Frobisher ores', in William W. Fitzhugh and Jacqueline S. Olin, eds., *Archaeology of the Frobisher Voyages* (Washington; London, 1993), pp. 137-145; Harkness, *The Jewel House*, Ch. 4.

<sup>19</sup> Simon Shaffer, 'Golden means: assay instruments and the geography of precision in the Guinea trade', in Marie-Noëlle Bourguet, Christian Licoppe, and H. Otto Sibum, eds., *Instruments, Travel and Science: Itineraries of Precision from the Seventeenth to the Twentieth Century* (London: Routledge, 2002), pp. 20-50.

<sup>20</sup> Christopher E. Challis, *The Tudor Coinage* (Manchester, 1978), p. 38; Steven Gunn, *Henry VII's New Men and the Making of Tudor England* (Oxford, 2016) p. 74.

<sup>21</sup> Christopher E. Challis, *A New History of the Royal Mint* (Cambridge, 1991), p. 401.

- <sup>22</sup> BL Harley MS 38, fo. 237r.
- <sup>23</sup> This feature of institutional life and office-holding became more pronounced over time. See Challis, *A New History of the Royal Mint*, p. 267.
- <sup>24</sup> Janelle Jenstad, ‘The Gouldesmythes Storehowse’ early evidence for specialisation’, *The Silver Society Journal* (1998) 43, pp. 40-43, at p. 40.
- <sup>25</sup> GHA, MS C II.2.1.
- <sup>26</sup> GHA, WA/CM, O3, fo. 454.
- <sup>27</sup> Anne Duffin, ‘Gamon, Hannibal (bap. 1582, d. 1650/51), Church of England clergyman’, *Oxford Dictionary of National Biography*, Oxford: Oxford University Press, 2018  
<<http://www.oxforddnb.com/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-10329>> [accessed 25 June 2018].
- <sup>28</sup> GHA, WA/CM, O2, fo. 313; O3, fo. 454.
- <sup>29</sup> See Records of London’s Livery Companies Online: Apprentices and Freemen 1400-1900 (ROLLCO) <<http://www.londonroll.org>> [accessed 20 October 2012].
- <sup>30</sup> The National Archives (TNA), T 48/92.
- <sup>31</sup> Carl Wennerlind, *Casualties of Credit: The English Financial Revolution* (Cambridge, Mass., London: Harvard University Press, 2011), Chs 3 and 4.
- <sup>32</sup> The anonymous sixteenth-century treatise can be found in BL Harley MS 660.
- <sup>33</sup> Helen Smith, ‘Grossly Material Things’: *Women and Book Production in Early Modern England* (Oxford, 2012), pp. 4-6.
- <sup>34</sup> Julia Crick and Alexandra Walsham, ‘Introduction: script, print and late medieval religion’, in Crick and Walsham eds., *The Uses of Script and Print, 1300-1700* (Cambridge, 2004), p. 9.
- <sup>35</sup> Field, “‘Many hands hands’: writing the self”, pp. 54-55; Leong, *Recipes and Everyday Knowledge*, p. 120, ‘the inherent malleable quality of recipes as text’.
- <sup>36</sup> William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton: Princeton University Press: 1994); Alison Kavey, *Books of Secrets: Natural Philosophy in England, 1550-1600* (Urbana, Ill.: University of Illinois Press, 2007); Elaine Leong and Alisha Rankin, eds., *Secrets and Knowledge in Medicine and Science, 1500-1800* (Farnham and Burlington, VT: Ashgate, 2011).
- <sup>37</sup> Cementation is ‘the process by which one solid is made to penetrate and combine with another at a high temperature so as to change the properties of one of them’. “cementation, n.”. OED Online. September 2019. Oxford University Press. <https://www-oed-com.chain.kent.ac.uk/view/Entry/29551?redirectedFrom=cementation> (accessed September 30, 2019).
- <sup>38</sup> BL Harley MS 38, fos. 279r-v.
- <sup>39</sup> Pamela Long, ‘The openness of knowledge: an ideal and its context in sixteenth-century writings on mining and metallurgy’, *Technology and Culture*, 32:2 (1991), pp. 318-355.
- <sup>40</sup> Christopher Bartels, ‘The production of silver copper, and lead in the Harz mountains from late medieval times to the onset of industrialisation’, in Ursula Klein and E. C. Spary, eds., *Materials and Expertise in Early Modern Europe: Between Market and Laboratory* (Chicago; University of Chicago Press, 2010), pp. 71-100, at p. 89.
- <sup>41</sup> Klein and Spary, ‘Introduction: why materials?’, in *Materials and Expertise*, pp. 1-23, at p. 6.
- <sup>42</sup> David Landreth, *The Face of Mammon: The matter of Money in English Renaissance Literature* (Oxford, 2012), pp. 7, 13, 17; Jennifer Bishop, ‘Currency, conversation, and control: political discourse and the coinage in mid-Tudor England’, *English Historical Review*, 551 (2016), pp. 763-792.
- <sup>43</sup> Daniel Jütte, *The Age of Secrecy: Jews, Christians, and the Economy of Secrets, 1400-1800* (New Haven: Yale University Press, 2015), p. 104.
- <sup>44</sup> Landreth, *The Face of Mammon*, p. 20.
- <sup>45</sup> *Ibid.*, p. 15.
- <sup>46</sup> Elaine Leong and Alisha Rankin, ‘Introduction: Secrets and Knowledge’, in *Secrets and Knowledge*, pp.1-10, at p. 9.
- <sup>47</sup> Jütte, *The Age of Secrecy*, p. 14.
- <sup>48</sup> Long, ‘The openness of knowledge’, p. 319, ‘A craft procedure can be described in writing, but often it is truly accessible only to those who have practiced the technique within their own hands.’ See also Pamela H. Smith, ‘In the workshop of history: making, writing, and meaning’, *West 86<sup>th</sup>: A Journal of Decorative Arts, Design History, and Material Culture*, 19:1 (2012), pp. 4-31, at p. 10.
- <sup>49</sup> BL Harley MS 38, fo. 246v.
- <sup>50</sup> Field, “‘Many hands hands’: writing the self”, p. 50.
- <sup>51</sup> Michelle DiMeo and Sara Pennell, eds., *Reading and Writing Recipe Books, 1550-1800* (Manchester, 2013), ‘Introduction’, pp. 1-22, at p. 11.
- <sup>52</sup> Leong, *Recipes and Everyday Knowledge*, p. 11.
- <sup>53</sup> Adam Smyth, *Autobiography in Early Modern England* (Cambridge, 2010), p. 2.

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- <sup>54</sup> BL Harley MS 38, fo. 246v.
- <sup>55</sup> On the ‘epistemic significance of making mistakes’, see Sven Dupré, ‘Doing it wrong: the translation of artisanal knowledge and the codification of error’, in Matteo Valleriani, ed., *The Structures of Practical Knowledge* (Cham: Springer, 2017), pp. 167-188, at p. 179.
- <sup>56</sup> GHA, MS C II.2.1, fos. 4v, 5v.
- <sup>57</sup> Lazarus Ercker, John Pettus, *Fleta Minor: The Laws of Art and Nature, in Knowing, Judging, Assaying, Fining Refining and Inlarging the Bodies of Confin’d Metals* (London, 1683), sig. A1r, pp. 228, 343.
- <sup>58</sup> Dupré, ‘Doing it wrong’, p. 184. On Dürer and “eye measure”.
- <sup>59</sup> BL Harley MS 38, fos. 262r, 274v
- <sup>60</sup> GHA, MS C II.2.1, fo. 5<sup>v</sup>.
- <sup>61</sup> GHA, MS C II.2.1, fo. 76<sup>v</sup>. Pamela H. Smith has also discussed the crucial role of embodied knowledge in artisanal practice. See *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago, Ill.; London: University of Chicago Press, 2004), esp. Ch. 3.
- <sup>62</sup> BL Harley MS 38, fo. 262r.
- <sup>63</sup> “softly, adv.”. OED Online. September 2020. Oxford University Press.  
<https://www.oed.com/view/Entry/183927?rskey=HwrCFU&result=2> (accessed September 10, 2020).
- <sup>64</sup> BL Harley MS 38, fo. 271r.
- <sup>65</sup> BL Harley MS 38, fos. 275r, 272r, 274r.
- <sup>66</sup> BL Harley MS 38, fo. 237r.
- <sup>67</sup> BL Harley MS 38, fo. 275v.
- <sup>68</sup> BL Harley MS 38, fos. 275r-v, 279v.
- <sup>69</sup> “prove, v.”. OED Online. September 2020. Oxford University Press.  
<https://www.oed.com/view/Entry/153398?rskey=IzVCfi&result=2> (accessed September 10, 2020).
- <sup>70</sup> Wendy Wall, *Recipes for Thought: Knowledge and Taste in the Early Modern English Kitchen* (Philadelphia: University of Pennsylvania Press, 2016), pp. 212-18. Wall suggests that the veracity of the phrase *probatum est* should ‘be assessed within their individual contexts’ (218). See also Leong, *Recipes and Everyday Knowledge*, p. 101.
- <sup>71</sup> Field, “‘Many hands hands’”: writing the self”, pp. 49-63.
- <sup>72</sup> BL Harley MS 38, fo. 273r.
- <sup>73</sup> BL Harley MS 38, fos. 252r, 273r, 265v, 262r.
- <sup>74</sup> BL Harley MS 38, fos. 264r, 274v
- <sup>75</sup> Leong, *Recipes and Everyday Knowledge*, p. 39.
- <sup>76</sup> For discussion of artisanal writing as a means of garnering patronage, see Pamela Long, *Openness, Secrecy, Authority: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (Baltimore, 2001), Chapter 6; Pamela H. Smith, ‘Why write a book? From lived experience to the written word in early modern Europe’, *Bulletin of the German Historical Institute*, 47 (2010), pp. 25-50, at pp. 33-35.
- <sup>77</sup> For the intense early modern interest in ancestry, see Daniel Woolf, *The Social Circulation of the Past: English Historical Culture* (Oxford; New York, 2003), Chs. 3 and 4. For recipe books as family histories, see Leong, *Recipes and Everyday Knowledge*, Ch. 5.
- <sup>78</sup> ‘A sense of the institution’s identity ... could include a set of myths about origins, rules about proper conduct, a sense of an institution’s purpose, the boundaries of the community ... and relationships with the rest of society’. See Anne Goldgar and Robert I. Frost, ‘Introduction’ in *Institutional Culture in Early Modern Society* (Leiden; Boston: Brill, 2004), xi-xxii, at xiii.
- <sup>79</sup> BL Harley MS 38, fo. 247r.
- <sup>80</sup> BL Harley MS 38, fos. 248v, 257v.
- <sup>81</sup> BL Harley MS 38, fo. 249r.
- <sup>82</sup> GHA, MS C II.2.1, fo. 2r.
- <sup>83</sup> GHA, MS C II.2.1, fos. 4v-5v.
- <sup>84</sup> Charles Johnson, *The De Moneta of Nicholas Oresme and English Mint Documents* (London, 1956), p. 65.
- <sup>85</sup> GHA, MS C II.2.1, fo. 25v.
- <sup>86</sup> Challis, *A New History of the Royal Mint*, p. 262, ‘This debate [...] was eventually decided by Lord Burleigh in Martin’s favour; with the result that sterling continued to be defined as 11 oz 2 dwt of fine silver and 18 dwt of copper at the comixture’.
- <sup>87</sup> GHA, MS C II.2.1, fos., 3v, 23r, 32r.
- <sup>88</sup> GHA, MS C II.2.1, fo. 27r.
- <sup>89</sup> GHA, MS C II.2.1, fo. 28v.
- <sup>90</sup> TNA, T 48/92, fos. 4-6, 16.
- <sup>91</sup> Wennerlind, *Casualties of Credit*, p. 122.
- <sup>92</sup> Woolf, *The Social Circulation of the Past*, p. 234.

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<sup>93</sup> Ibid., p. 2 ‘a great many people of varying degrees and disparate backgrounds cared very much about various aspects of their individual and collective pasts, though not necessarily the same aspects, not all for the same reasons’. See also Ian W. Archer, ‘Discourses of history in Elizabethan and early Stuart London’, *Huntington Library Quarterly*, 68 (2005), pp. 205-226, p. 214, ‘we can see that historical materials (whether chronicle or fictional [...]) were widely available and that Londoners engaged with the past in a variety of different and probably overlapping ways’.

<sup>94</sup> Senate House Library Archives, University of Library (SHLA), GB 96 MS 21.

<sup>95</sup> Simon Wortham, ‘Sovereign counterfeits: the trial of the pyx’, *Renaissance Quarterly*, 49:2 (1996), pp. 334-359, at p. 335.

<sup>96</sup> Challis, C. E. “Martin, Sir Richard (1533/4-1617), goldsmith.” *Oxford Dictionary of National Biography*. 23 Sep. 2004; Accessed 10 Sep. 2020.

<https://www.oxforddnb.com/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-18205>.

<sup>97</sup> Challis, *A New History of the Royal Mint*, p. 260.

<sup>98</sup> SHLA, GB 96 MS 21, fos. 1v, 5r.

<sup>99</sup> SHLA, GB 96 MS 21, fos. 3v, 5r, 6v.

<sup>100</sup> SHLA, GB 96 MS 21, fo. 3v.

<sup>101</sup> Steven Shapin, ‘The house of experiment in seventeenth-century England’, *Isis*, 79 (1988), pp. 373-404; Leong, *Recipes and Everyday Knowledge*; Simon Werrett, *Thrifty Science: Making the Most of Materials in the History of Experiment* (Chicago, 2019).