if the light source used were powerful enough, revealed invisible ink is, as can be seen from the various figures, much fainter than black ink.[89]

Gregory's reticence regarding its actual design is perhaps not surprising given his constitutional aversion to giving away valuable secrets, but a decade later he would give more clues in his letters to Robert Cecil: 'Your perspective glass with the box is in hand & shall be finished with expedition. The crystalline is most fair and large – I could not find such an other.'[90] What was earlier a contraption attached to a desk, the ironwork of which 'would serve', and which used a 'glass' or mirror 'to counterfeit', had now developed somewhat. Gregory now spoke of a 'perspective glass with the box', noting that it also uses a 'crystalline' or circular lens. The perspective box was constructed specifically to facilitate the easy copying of documents. Typically, Gregory's offer of a new technology is wrapped up in a promise of demonstration: 'I will most frankly discover [display] the depth of my skill & deliver unto your honour the Box with the perspective glass finished with all these subtleties, & instruct your honour in the secret use thereof.'[91] The development of Gregory's perspective box was plainly beset with teething troubles, and after asking that he be 'excused the intolerable delay of the workman in your box for your crystalline glass, which now I am promised presently' his pen fell silent on the matter in 1596.[92]

A decade later Gregory wrote to Cecil not with promises of what he could achieve, but with reminders of what he had achieved in the case of Garnett and Vaux – that is, 'discovering the secret writing, being in blank … & leaving the same at last in blank again'.[93] It was in a pair of postscripts that Gregory revealed his intentions. In the first, he wrote that 'Mr Lieutenant [Waad] expecteth something to be written in the blank leaf of a Latin Bible which is pasted in already for the purpose. I will attend it and whatsoever else commeth.' It is unclear who has possession of this Bible, but it may well be the Bible Garnett mentions in his letter to Anne Vaux of 3 March, which would suggest that Gregory was already in the Tower by this point, and had begun his work.[94] The blank page is prepared for a message, one which Waad and Gregory fully expect will be written in invisible ink. The second postscript sees Gregory's intention of reintroducing his perspective box: 'I have a box with a desk which I

prepared many years since for your Lordship the crystal is broken but I will find a new: it may serve to excellent use.'[95] The use Gregory refers to is counterfeiting letters written in invisible ink. Waad and Gregory were anticipating the use of invisible ink, and already purposed to intercept, reveal and reproduce any letters that used it. It was for this task that the dark artificer had resurrected his perspective box.

Gregory's perspective box was probably a rather clever variation on the well-known contraption, the *camera obscura*. As with much contemporary technology, the *camera obscura* (literally 'dark chamber') was developed over centuries following the observation of a natural phenomenon, namely that if light is allowed into a darkened room through only a small hole or aperture, images of the outside are projected onto the wall opposite the aperture. This phenomenon was being commented upon as early as 300 BCE, with experiments being carried out to understand it in the centuries that followed. By 1545 the first illustration of a *camera obscura* had appeared in print.[96] The use of a glass disc or lens was described in Cardano's *De Subtilitate* in 1550, and in 1558 della Porta's *Magiae Naturalis* included an *obscurum cubiculum* as an aid to drawing.[97] The name '*camera obscura*' was coined by Johannes Kepler in 1604, and in 1620 he would tell Sir Henry Wotton, Stuart ambassador in Vienna, that the device allowed him to produce drawings '*non tanquam pictor sed tanquam mathematicus*' ('not like a painter but like a mathematician'). Kepler's camera was portable, and made use of 'a long perspective trunk' (also a common name for the telescope) with convex and concave glasses (mirrors) such that the 'visible radiations of all the objects without are intramitted falling upon a paper which is accommodated to receive them'. Wotton described the device to the then lord chancellor Francis Bacon, 'because I think there might be good use made of it for chorography [mapmaking]'.[98] (Mapmaking was another of Gregory's services; he reminded Walsingham in 1586 of 'my several plans and journeys to Dover and the last plan of Ireland'.)[99]

The *camera obscura*, however, projects an inverted image. This makes it perfectly good for mapmaking, but rather less useful for copying letters. A device called the *camera lucida* solved this problem: it creates the illusion of an uninverted image projected onto paper when the user looks through its primary mechanism, a prism. Generally considered to have been

invented by William Hyde Wollaston in 1807, the *camera lucida* appears to date back to at least 1652 and the development of Sir Christopher Wren's 'perspectograph', a '*camera lucida* equipped with a sight … moveable along a mechanical track or pulley system', if not to 1596 and Gregory's perspective box.[100] Both Wren's perspectograph and Gregory's perspective box were themselves preceded by della Porta's description of how to use a 'concave glass' (in this instance, a lens – the word glass was used for both lens and mirror) to make an image appear as if 'hanging altogether in the air', such that it can be seen by none but 'those that stand over it'.[101]

As an active dark artificer, Gregory understood the value of being able to make quick and accurate facsimiles of documents in the field, and this impelled the creation of his perspective box. It seems likely that he inferred his instrument from della Porta's discussion of 'pyramidal glass' and how to fit various lenses into 'some table, or iron', in such a manner that it will 'shew you many diversities of images', specifically 'the right side will show right, the left the left, whereas the nature of plain glasses, is to show the right side as left, and the left side as right'.[102] While della Porta considered that the method of projecting an uninverted image in this manner was 'a great secret: many have tried it, but none could obtain it',[103] Gregory's facility in copying invisible ink letters strongly suggests that he succeeded where others failed.

Gregory's perspective box most likely comprised one or more crystals fitted into a wooden box and positioned by some sort of metal frame. All that remains of it are these few, epistolary fragments and their corroboration in a book we know he read. With access to such technology, and a little care, anything could be copied, and considerably faster and more accurately than by a scribe working freehand. Furthermore, copying in invisible ink would also be not only possible but relatively simple. The great advance was that the scribe did not need to take their eyes from the paper on which they wrote. Gregory saw the potential of such a device.

The battle waged between Arthur Gregory and the correspondents Henry Garnett and Anne Vaux was one of competing technologies. Unfortunately for the Jesuit and his co-conspirator, Gregory's ingenuity made it something of a David and Goliath affair, only this time, Goliath won, and comfortably so. Garnett and Vaux relied on marmalade, fruit juice

and talk of spectacles to keep their secrets from view, Gregory on advanced optics, control of the postal channels and no little imaginative skill to reveal them. It really was no contest.

5

STILETTOS & STORYTELLING

In 1565, a ship's barber-surgeon found himself taking direct orders from the commander of the Venetian fleet concerning a patient of his, a Turkish privateer recently taken captive. He was told in no uncertain terms to poison the man. What he did not know, however, was that this order had not come from the commander himself, but directly from the Council of Ten, the Venetian state security council. They wished to rid themselves of the privateer on a permanent basis, and for it to appear that he had died from the injuries sustained during his capture. To prevent the Turks from apprehending the true reasons for the privateer's demise, the Ten also requested that the commander return the letter containing their instructions. This was not unusual behaviour: state-sanctioned assassination, while part and parcel of the everyday working lives of the Ten, was not something to be routinely communicated to the enemy. That any trace of such orders still exists in the archives is astonishing, perhaps a sign that in Venice filing had turned into an unsuppressible and habitual obsession. The insistence on their operatives using a particular method to dispatch foreign spies was not unusual, either. Keen to do away with Mustafa dai Cordoani, a legate of Mehmet Pasha's whom they were convinced was in fact a spy, they asked Marchio Viladrino, a physician and professor of botany at the University of Padua, to concoct a poison specifically for the purpose. When Viladrino's confection proved anything but toxic (it failed twice), they approached another physician, one Comasco, to finish the job. Comasco's contribution also failed, and Mustafa lived to eavesdrop again – at least, until, having returned to Venice a few years later, he was found dead in the street. The

official cause was the plague, but the Ten knew better: they had instructed the latest assassin, whose code name was ‘Captain Trec’, to ensure that the corpse resembled a plague victim’s.[1]

Poison was not the only weapon wielded by Italian counter-espionage operatives, though it was the most difficult to detect, and thus often the most politically useful. Venice itself was home of the infamous *bravi*, a group of killers-for-hire who were, according to the travel writer Thomas Coryate, most associated with ‘a little sharp dagger called a stiletto [or ‘little steel’]’.[2] The association between Italy and the stiletto was reinforced by the weapon’s repeated mention in official intelligence reports, and on the stages of London’s theatres.[3] Its use was also reported by later travel writers, such as John Raymond, who noted the pugnacious nature of Italians who, should they end up in a fight, knew that ‘if in the contest their stiletto should do mischief, the next church may be their asylum, where no law or violence can attempt them’. This posturing went deep, he suggested: ‘the common mode of the scholar is to go arm’d with a pair of pistols, and a stiletto by his side’.[4] Like the pistol, the stiletto had but one purpose: to kill. After penetration, the blade was to be moved around inside the victim, causing maximum damage.[5] The expectation appeared to be that a stiletto would most likely be used on an unarmed opponent – there seems little other explanation for why a popular 1536 manual of combat techniques written by the Italian fencing master Achille Marozzo, *Opera Nova*, included several pages detailing how an unarmed man might defend himself from an attacker brandishing such a blade.[6] A bladed weapon required strength, courage and no little skill to wield effectively, however, and was only effective at close, if not intimate, range. Any attempt to assassinate a well-known individual might well prove to be a suicide mission: such a target would invariably be accompanied, at the very least by courtiers, who would be likely to take instant and bloody revenge.

In English eyes, the depravity of Catholic Rome, Italy, poison and the stiletto were often conflated, as we see recycled in an incendiary polemic written after the Papal Bull issued by Urban VIII in 1627. Here Henry Burton raged against Catholics in Italy, calling stilettos and poisons their ‘usual weapons’.[7] While the Venetian Council of Ten were quite happy to engage chemists to mix new poisons and put them to use, engage the

stiletto-wielding *bravi* and even specifically request that an individual be strangled if the assassin thought fit, assassination played little part in English espionage and counter-espionage policy until the Interregnum.[8] Officially, at least – it was rumoured that one of Cecil's spies, Robert Poley, had assassinated the bishop of Armagh in the Tower of London with poisoned cheese.[9] Assassinations may have been rare, but simple murders were less so. Life was cheap in sixteenth-century England, and Poley would later bear witness to the playwright and one-time spy Christopher Marlowe receiving a fittingly metonymic dagger in the eye in a Deptford tavern.

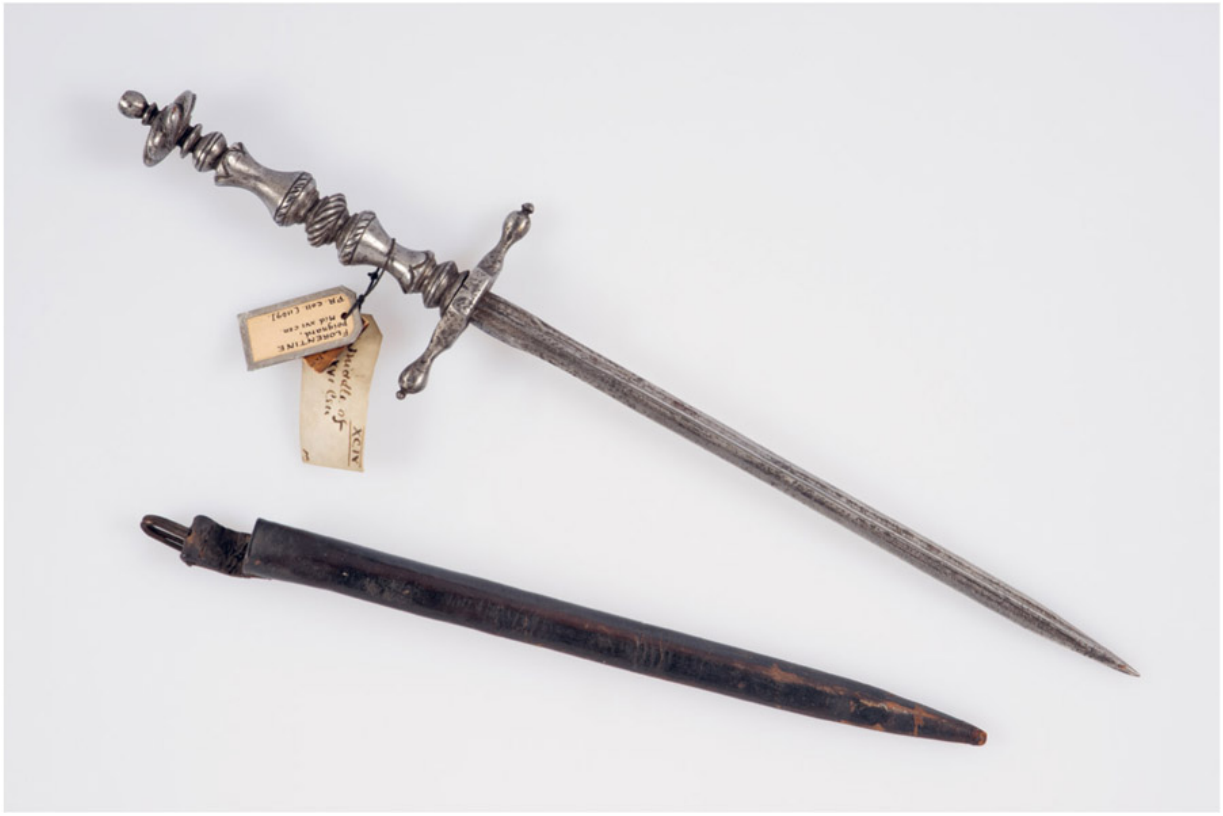

Fig. 51: A stiletto, or 'little steel'. An evolution of the poniard, it was developed to deliver the coup de grace to a beaten yet armoured opponent – the blade's shape concentrated the user's force into a small area, allowing it to pierce armour or chainmail, or to prey on vulnerable areas such as the eye slits.

Fear of the assassin hiding in the shadows did not merely derive from the hyperbole of attention-seeking travel writers and polemicists, however. Queen Elizabeth I and her advisors were particularly afraid of any threat they could not see, and this included any weapon that could be easily

concealed until needed. The danger was perceived to be very real, not merely because of the specific threats made against the queen and, latterly, her successor James. While poison may have been their greatest fear, there were other surreptitious weapons that could give the spy or conspirator the upper hand: one of these came in the shape of the handgun, or 'dag'.

WHAT'S UP YOUR SLEEVE?

The assassination of the Scottish regent James Stewart, 1st earl of Moray, on 23 January 1570, was perhaps in itself no great shock, considering the state of Scottish politics in the latter half of the sixteenth century – some might consider that he received his just deserts, considering that barely two years previously he had attempted to have Mary, Queen of Scots assassinated by proxy with the Casket Letters. That his murder was carried out by a Catholic, James Hamilton, was thus also unsurprising. Most of the high-level assassinations executed during the late sixteenth and early seventeenth centuries – including those of the Huguenot Admiral Gaspard de Coligny (1572), William the Silent (1584), Henri III (1589) and Henri IV (1610) of France – were carried out by Catholics. This rather skewed statistic can largely be attributed to theology.[10] A Catholic could not only be convinced that they were doing God's work by removing a heretic from his earth, but could be sure that such an act would secure them a place in heaven. A Protestant, however, whose faith denied salvation through works, could be secure in no such conviction, and neither could they be absolved of all sin through an act of intercession (though this did not preclude their ever carrying out actions). The assassins themselves were often disgruntled soldiers, and almost always fanatics. Naturally, many were also persuaded to a course of action by financial inducements: Philip II of Spain was quite public in placing a bounty of 25,000 crowns on the head of William the Silent, and allegedly offered the royal physician Roderigo Lopez 50,000 crowns to murder his own patient, Elizabeth I.

What troubled many observers was the weapon that Hamilton used to murder Moray: an arquebus. Moray himself had seen the dangers of the increasing proliferation of firearms throughout the public domain,

especially weapons such as the arquebus (which required less skill to operate than more traditional projectile weapons such as the longbow), and had attempted to ban their public carrying by royal proclamation two years before he met his untimely end.[11] The arquebus possessed a dangerous combination of range, accuracy and destructive potential, but it lacked one property crucial to the assassin: subtlety. It was big, cumbersome and required some effort to conceal, not least because it was fired by the application of a smouldering taper to the gunpowder charge (also known as a matchlock), with all the obvious problems that presented. Hamilton had the luxury of being able to conceal his weapon in a first-floor room of a house that Moray was due to pass by on horseback. While effective, an arquebus was hardly convenient. What the assassin needed was an easily concealable weapon that could be operated with one hand; this was found in a lethal technology that would revolutionise the business of targeted, high-level assassinations, the wheellock pistol.

The wheellock was a complicated mechanism that created its own spark by grinding a steel wheel against a sparking material (usually iron pyrite) which would, in turn, ignite the gunpowder charge in the pan and thus fire the weapon. The wheellock could be carried primed and ready to fire, and thence operated with one hand, a major advantage over the matchlock. On the downside, its mechanism was fiddly and unreliable, and required a separate key to 'wind up' the spring to ready it for action. While more expensive and less reliable than a matchlock – like a watch, it needed constant attention to function at its best – the wheellock rapidly became the weapon of choice for cavalry units, in themselves a social and military elite, on account of its particular advantages.[12] Wheellocks came in different sizes, from the long, powerful weapons wielded in battle to smaller versions such as the one shown in Fig. 52. That they came in such a relatively diminutive size and lacked a smouldering taper meant that these weapons, known as 'dags', 'could readily be hidden in a pocket or sleeve'.[13]

Many governments saw the danger presented by the proliferation of such easy-to-conceal yet destructive weapons; dags were described as 'diabolical', 'destructive' and even 'impious', and were banned from Habsburg territories by the emperor in 1518.[14] By 1541, the English Parliament had 'little shorte handguns and little hagbuttes' and their use in

‘detestable and shameful murders’ in its crosshairs. A new law was drawn up, including a clause stating that a demi-hake (the equivalent of a pistol) ought be no shorter than 2 feet 3 inches (around 70 centimetres).[15] Prescribing a minimum length was intended to make concealment virtually impossible. The same problem was being acknowledged across Europe: in 1542, the Venetian state, ever cognisant of the technologies that fuelled illicit activities, outlawed any firearm diminutive enough to be hidden in a sleeve.[16] Fear of dags was inversely proportional to their size. In England, therefore, further legislation was devoted to controlling the ‘pocket dag’, a smaller and somewhat easier-to-hide variant, and in 1549, Edward VI issued another proclamation prohibiting them from being carried within 3 miles of court.[17] This did little to prevent sixteenth-century men from showing off their wheellock dags in portraiture as a symbol of their wealth and status.[18]

Fig. 52: A 1577 portrait of the privateer Martin Frobisher showing the promising ratio of handgun to sleeve. Fashions of the time perhaps enabled the concealing of a weapon larger than one might expect, and a cloak one larger still, at least for a short time.

All this legislative paranoia was as well justified as it was useless, as Moray discovered to his cost, and it was not long before a wheellock pistol was used in a successful assassination, one which sent shockwaves around the courts of Europe. Moray may have been the first head of state to be

assassinated with a firearm, but he had met his maker while on horseback on a public road. William the Silent would be the first head of state to be killed with a handgun. What is more, it was the weapon's relatively diminutive size that allowed his assassin to execute his commission in the place where William ought to have been at his most secure: his own court.

SILENCING WILLIAM

When William of Orange became stadtholder of the provinces of Holland, Zeeland and Utrecht in 1559, Philip II thought he had found himself a loyal man who would support Spanish rule in the Netherlands. Matters did not proceed as he expected, however. Philip clashed repeatedly with William, leading to the latter's removal from his positions in 1568–9. By 1580, William, known as 'the Silent' on account of his ability to keep his political strategy close to his chest despite his well-known tendency towards loquaciousness, had become such a thorn in Philip's side that the Spanish king issued a proclamation exhorting loyal Catholics to assassinate him. A bounty of 25,000 crowns, lands and titles awaited the successful assassin.

In 1582, an eighteen-year-old from Bilbao, Juan de Jáuregui, who was working with the knowledge of the Italian cardinal Alessandro Farnese, pulled a dag on William during Sunday lunch. Overcharged with powder, Jáuregui's weapon misfired, removing his thumb as it did so. The unfortunate Jáuregui was promptly stabbed to death by William's men.[19] While his life had been saved by this misfire, William was badly injured, with some reports suggesting that the shot passed through his tongue while the discharge of gunpowder set light to his beard. Rumours of his death spread rapidly. William, now physically incapable of speech, was in no condition to rebut them, though his staff did so immediately.

Perhaps inevitably, two years later, on 10 July 1584, a second attempt was made on his life. This time, there would be no mistake. Balthasar Gérard, William's successful assassin, was by all accounts a spy recently recruited to provide information on Spanish troop movements. It was through this employment, and his judicious use of forged documents declaring him to be one François Guyon, that he had managed to worm his

way into the stadtholder's entourage.[20] Having been appointed to serve on a diplomatic embassy to France as a lowly servant, Gérard eventually gained an audience with William at his Delft residence, the Prinsenhof, where he revealed his dag and fired. Gérard had loaded it with three bullets to increase its destructive power and reduce the possibility of missing his target – the bullets were connected with wire, in imitation of the naval chainshot used to tear through a ship's rigging. This new payload did shorten the dag's effective range, but it was still considerably further than the arm's length demanded by a stiletto. As the ability to launch an assault from even 5 metres from the target might make the difference between the instant and deadly retaliation of the target's companions and the assassin's escape, the attraction of the dag becomes clear. Three bullets were enough to ensure a lethal outcome. William died almost instantaneously; two of the bullets passed through his body before lodging themselves in the wall of the Prinsenhof, while the third remained in its target.[21] Unlike his predecessor Jáuregui (who, one imagines, was rather too shocked by his own injuries to flee before William's men put him to the sword), Gérard managed to escape the scene of the crime. Even though he had discharged his dag at close range, he made full use of the few feet that had stood between him and his target and the small headstart this gave him over William's guards. His freedom was short-lived, however, as he was soon captured. When interrogated, he swore that he had acted alone and out of religious fervour (as well as a desire for the 25,000-crown reward promised by Philip II). He stuck to this story even after being put to torture. Gérard possibly regretted having not suffered Jáuregui's fate, but he nevertheless showed great determination, enduring several hours of public torture before his eventual disembowelment and quartering.[22] Assassination was a dangerous business for all concerned.

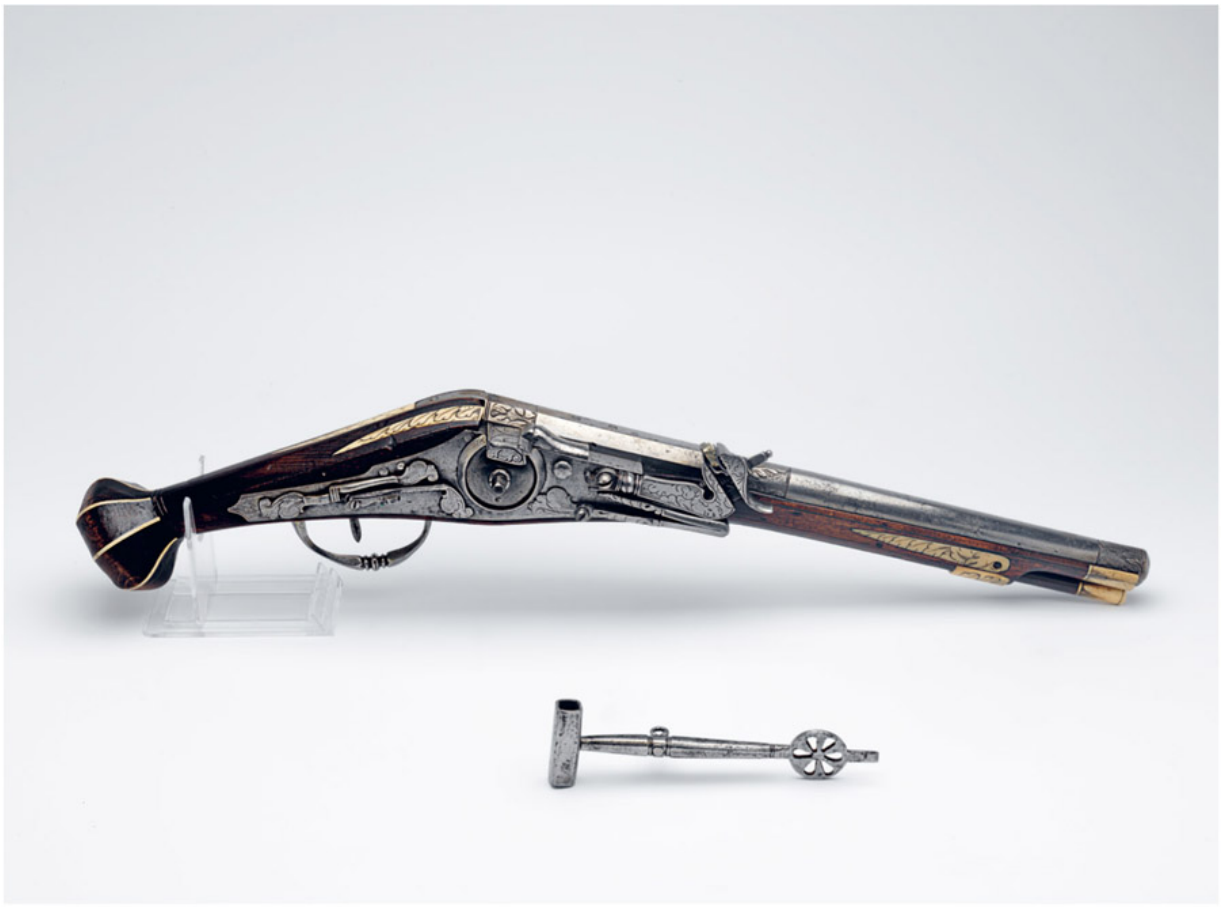

Fig. 53: A wheellock dag, with key for priming its spring.

EUROPEAN REVERBERATIONS

The shockwaves following William's death were palpable: Gérard's triple shot wheellock had upped the ante. Within a week of the assassination, the English ambassador in France, Sir Edward Stafford, warned Walsingham that there were three 'practisers' ready to do to Elizabeth (amongst others) what had just been done to William, and that within the next two months. Noting his suspicion that the information had been fed to him by a Spanish agent anxious to curry favour with the queen, he nevertheless concluded that the threat could not be ignored: 'there must no doubt be had that she [Elizabeth] is a chief mark they shoot at'.[23] Given the penchant for uncovering plots that reinforced the government's worst fears, it is no

surprise that two such ‘conspiracies’ to do away with the English queen using handguns were subsequently, and very publicly, foiled.

The first was a rather unlikely plot allegedly formulated by the mentally unstable twenty-three-year-old John Somerville of Warwickshire. Somerville declared to all and sundry that he ‘meant to shoot her [Elizabeth] through with his dag and hoped to see her head to be set upon a pole for that she was a serpent and a viper’.[24] He had forgotten the first rule of the successful assassin: tell no one. Along with his in-laws, Somerville was promptly arrested for ‘the most wicked and desperate act by [him] intended’.[25] He had forgotten the second rule, too: be inconspicuous (he wore ‘buttons of gold on his cape and doublet’, gifts, he proudly alleged, from Mary, Queen of Scots).[26] Two months later Somerville was condemned to death and moved from the Tower to Newgate, where he was found strangled in his cell. No cheese was found at the scene; the official cause of death was suicide. His father-in-law was executed as a traitor the next day.[27]

The second plot was far more intelligently organised, but equally dubious. It revolved around William Parry, who worked for Walsingham, and yet the reporting of the case accentuated his dealings with Thomas Morgan, a known agent of Mary, Queen of Scots.[28] His first plan was to assassinate Elizabeth while she walked in the garden. Having been told that he could not ‘carry a dag without suspicion’, Parry replied ‘as for a dag … I care not: my dagger is enough’. Alternatively, he suggested, the queen might be set upon in St James’s by a group of men: ‘it is much … that so many resolute men may do upon the sudden, being well appointed with each his case of dags’. He would not suffer Gérard’s fate, however: ‘those that shall be with her, will be so busy about her, as I shall find opportunity enough to escape’, not least as his co-conspirator was charged with readying a barge to receive him.[29] Parry was more than aware of the opportunity that the dag presented, as even a small headstart over one’s pursuers could prove vital if one wanted to escape.

Amidst all this bluster, in which the ‘handgun stood for the ever-present threat of Catholicism reaching out into the heart of Protestant England to snatch the life of the monarch’, the English Privy Council were clearly rattled.[30] The most recent proclamation against firearms, from 1579, had

reiterated that dags and other such weapons were ‘only meet [i.e., suitable] for thieves, robbers and murderers’. No one was to discharge a weapon or even carry one ‘charged with shot and powder’ other than ‘at and in the places that are or shall be appointed for common Musters’, nor were they to be used within two miles of any place occupied by the queen. Furthermore, the houses of anyone suspected of possessing or selling any ‘small Dags, called pocket Dags’, were to be searched, and any weapons found immediately seized. Finally, no one was to make, mend, import, sell ‘or otherwise to utter any such small Pieces as are commonly called pocket Dags, or that may be hid in any Pocket, or like place about a man’s person, to be hid or carried covertly’.[31] There was nothing more to be done. In 1610, Waad wrote to Salisbury of a gunmaker called Baker (aka John Tomkins) who, he asserted, had sold upwards of forty dags by May of that year.[32] As was so often the case, the law hung grimly on to the coat-tails of common behaviour for as long as it could, but was eventually shaken off and left bruised and battered by the side of the highway. The authorities were fighting a losing battle, and despite further proclamations in 1613 and 1616, when King James was spooked by rumours of another Spanish armada and a new shipment of pocket dags arriving from Spain, the impossibility of controlling such weapons was finally recognised. In any case, the wheellock was gradually being replaced by the cheaper and more reliable flintlock mechanism: the dag was here to stay.[33]

By the middle of the century, dags could be made that fitted into the palm of the hand. John Raymond took note of a particularly cunning contrivance during a trip around Italy in 1646–7, writing that ‘At Venice I saw a pocket Church Book with a pistol hid in the binding, which turning to such a page, discharges. A plot (I conceive) to entrap him you hate, whilst you are at your devotions together, when there is least suspicion.’[34] It may well be that this was the same mechanism that was delivered to Francesco Morosini, doge of Venice at around the same time, though this dag-bible was fired by pulling on the ribbon that served to mark the owner’s place (presumably Romans 12:19, ‘Vengeance is mine’).[35] Raymond had a particular interest in secret or silent weaponry, noting three further spy-adapted contraptions, namely ‘a pocket stone-bow [a cross between a catapult and crossbow that fired pellets rather than bolts], which held under

a cloak shoots needles with violence to pierce a man's body, yet leaves a wound scarce discernable', a walking staff that 'will jet forth a rapier with force enough to kill at a yard's distance', and a gun 'charged with wind', which was fatal from 'six paces' yet made almost no sound.[36]

Ultimately, fear of the dag was due less to its firepower and its effectiveness at ranges beyond those of stiletto or sword than the ease with which it could be concealed, largely a function of the technological advance that was the wheellock. Less intimate than the stiletto, the wheellock pistol still required that the assassin remained in position until the very moment that they released their murderous cargo. It did not, however, demand anything like the blind courage required to plunge a dagger into the heart, temple or eye of a target who was quite probably in armed company. At the moment of truth, however, all pretensions to stealth were abandoned, and the assassin's chances of escape might very well hang on those few, valuable metres afforded him by the wheellock pistol's greater range.

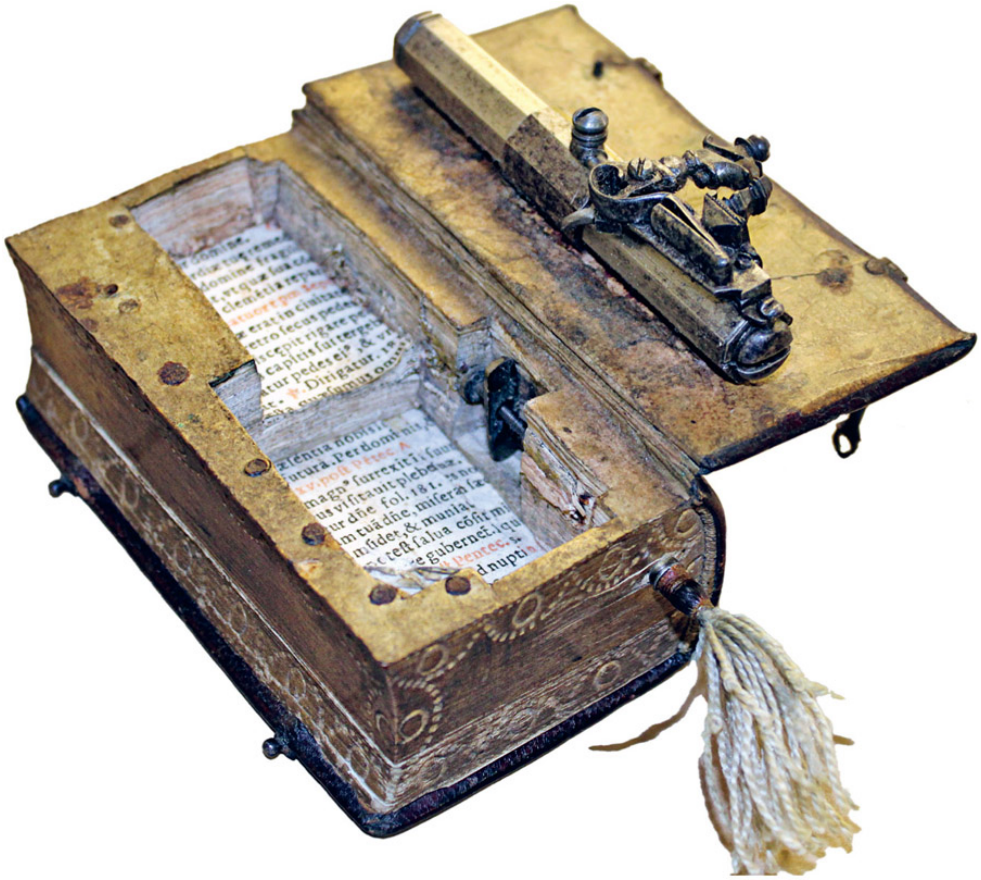

Fig. 54: This late eighteenth-century dag, concealed in a book of hours from 1627, was bought on the Rialto in Venice in 1810. It does not take much imagination to conclude that the buyer was on his Grand Tour, and returned home convinced that he had stumbled upon a piece of history, 'a bookgun once owned by Morosini'.

There was, however, a weapon as silent and invisible in operation as the very best spy, one which allowed the assassin to make good their escape before the moment of truth. It was also a weapon that relied on planning and cunning rather than physical strength or training for its success. Furthermore, given the right support, it was the most egalitarian of murder weapons, as it allowed for the employment of the most inconspicuous of co-conspirators such as servants and housemaids. This weapon was poison.[37]

FOOD POISONING AND UNICORNS

While Mary, Queen of Scots had watched her Italian secretary, David Rizzio, stabbed to death in front of her while a pistol was allegedly held to her belly, it was neither fear of the blade nor of the pistol that kept her awake at night: it was fear of poison. This fear, while it perhaps blossomed beyond the bounds of reality, was not entirely unfounded: in 1551, while she was living at the Château Royal d'Amboise in France, a plan to lace her favourite dish of 'frittered pears' with poison was only narrowly thwarted. How much this episode affected the eight-year-old Mary is unclear, but it caused her mother enough anxiety to postpone her own return to Scotland.[38] In later life, Mary took any mention of poison seriously. In December 1570, the Spanish ambassador to England wrote to his master: 'It is true she [Mary] is not well, and is in much greater fear for her life than formerly, in consequence of a warning that she has received from a doctor, astrologer and sort of conjurer, to the effect that they are going to give her poison in her food, and who even goes so far as to indicate the day when it is to be done.'[39] Mere months after the astrologer's prediction, and despite being incarcerated in Sheffield Castle, Mary received news that her son's regent, the earl of Lennox, had told Monsieur Verac, once *valet de chambre* to the French king and thence an active agent for her cause in Scotland, that her life was to be taken by poison.[40] She wanted to gather evidence of Lennox's

evil intent, and began by asking whether Verac could testify in writing that the rumours were true. Lennox discovered Mary's letter amongst Verac's papers, and was so incensed that he had the Frenchman locked up. He then made him write, presumably under no little duress, that her apprehensions were false: 'I … assure you, madam, as the truth is, that he [Lennox] has not spoken to me, nor held any proposal that might threaten your life, be it by poison or otherwise, and I cannot think who has given you this intelligence.'[41] Whether or not Mary believed Verac's testimony, her men shot Lennox dead during a raid on Stirling Castle not nine weeks later; perhaps she had been unwilling to give her son's regent the benefit of the doubt.

Her fear of poison would not relent: 'I am not out of danger if my food is not closely watched', she wrote to the archbishop of Glasgow in 1574, '[I must] have recourse to … a bit of fine unicorn's horn, as I am in great want of it'.[42] Unicorn horn, in its solid state, was supposed to indicate the presence of poison by effervescing; in its powdered (or 'fine') form it was considered a cure for many ailments, including poison. It had, of course, nothing to do with unicorns, being rather the tusk of the narwhal – nor did it actually work.[43] While Mary was bemoaning her lack of this wonder substance, Sir Francis Walsingham was shutting down an underground postal channel run by the travelling bookseller Henrye Cockyn of Fleet Street.[44] Walsingham's interrogations revealed unexpected information, namely that Mary was not merely sending and receiving ciphered letters enclosed in Cockyn's books, but also more substantial fare in the form of mithridate.[45] Named for the king of Pontus, Mithridates VI (132–63 BCE), who, legend had it, rendered himself impervious to poisons, mithridate was a rare and expensive substance believed to act both as prophylactic and antidote. Various recipes were available, each of which comprised some fifty-four ingredients, and all of which were supposed to derive from the king's original formulation.[46]

The mithridate delivered to Mary took a suitably convoluted route: Cockyn was given a half-pound tin of the substance by Nicholas Jude, the 'French ambassador's man', who had received it from the apothecary Humphrey Wymmes, who had been ordered to deliver it, along with various other items, by Dr James Good. For his part, Wymmes insisted from his

accommodation in the Tower that he had no knowledge of the good doctor's being 'privy to their [mithridate or treacle] being sent to the Scottish Queen', nor that he himself had knowingly delivered such substances to her via Nicholas. (The second substance, 'treacle', or 'theriac', was another multi-ingredient antidote). Wymmes and Good diverged slightly in their estimation of who paid for the delivery: the former suggested the French ambassador's servant; the latter the ambassador himself, Michel de Castelnau.[47] To further muddy the waters, Cockyn stated that Good had told Mary that the mithridate in question came from Frances Newton, Baroness Cobham. One of Elizabeth I's chamberers in 1558, Cobham had eventually risen to lady of the Bedchamber.[48] Betrayal came from within.

The fact that Cockyn, ostensibly the mere 'postman' in the underground network, seems to have known exactly what each of the individuals who comprised his 'postal round' wrote to one another seems, on the surface, rather odd. It is in Dr Good's examination that we find the answer. Cockyn was no mere go-between: he acted as de facto cipher secretary for those outside Sheffield Castle to whom he delivered messages, both deciphering them and enciphering the resulting replies, using a key he had presumably memorised to '"engleishe" such words in the same as were in cipher'. Good swore that he received neither alphabet nor cipher 'from the Scottish Queen or from any other', and, having none of his own, did not know 'of any cipher but Cockyn's'.[49] Cockyn, naturally, saw things differently, but if there was one constant within this, or any other circle of conspirators, it was the instinct to shift the blame onto someone else. In any case, having enciphered Good's letter, Cockyn knew that the doctor had written to Mary that the mithridate had come from Lady Cobham, whom he had earlier tried to keep out of his testimony.[50]

Not long before the failure of the Babington Plot a decade later, Mary wrote to her old friend, the by then compromised French diplomat Castelnau: 'I cannot but bethink me … of the practices and divers attempts which have been made against my life since I have been in this country, sometimes by violence, sometimes by poison, some of which I have already made known to the said Queen, with the names and surnames of the instigators and actors'.[51] Whether or not it was the mithridate and theriac smuggled into Mary's many and various jails that foiled the alleged poison

plots or simple cunning, it is tempting to speculate that Walsingham's keenness to uncover their source may have resulted from his sheer frustration concerning Mary's continued existence. Certainly, rumour had it that he was intent on poisoning her following her 'final' arrest – presumably to avoid another farcical show-trial like the tribunal of 1568–9.[52] Mary did not, perhaps, expect that she would be poisoned by the testimony of her own trusted secretariat – when Walsingham imprisoned Nau and Curle he might have remembered Cockyn, and reflected further on how a cipher secretary often sat in the centre of each conspiratorial web, his knowledge of all the actors serving as venom enough. Walsingham might also have viewed the discovery of a new source for mithridate and theriac, both rare and expensive substances, as timely: there were rumours originating from Bruges that Lord Burghley would be poisoned.[53] Perhaps Mary's supplier could get her hands on more?

Mary was not the only queen who feared the silent judgement of the poisoner's art: her great rival and cousin Elizabeth I had precautionary measures against such an eventuality built into her daily routine. In 1568, one of Walsingham's Italian correspondents delivered a warning: 'the advices [Elizabeth] has recently received are not by any means to be despised, and begs her to exercise great watchfulness over her food … lest poison should be administered to her by secret enemies'.[54] The 'advices' to which he referred were most likely 'Certain Cautions for the Queen's Apparel and Diet', one of which read as follows: 'that it may please Your Majesty to take the advice of your physician for the receiving weekly, twice, some preservatiff *contra pestem & venena* [against pestilence & poison]'.[55] It is not clear what manner of 'preservatiff' Elizabeth was encouraged to take, but given Walsingham's particular interest, mithridate and theriac were presumably leading candidates – the French surgeon royal Ambroise Paré recommended they be taken in the morning for just this purpose, next to a 'conserve of roses, or the leaves of rue, a walnut and dry figs', and, not to be forgotten, 'a little draught of muscadine or some other good wine'.[56] It may have been this regimen that gave Elizabeth the confidence to eat the sweetmeats Mary sent her in the late 1570s, ignoring Walsingham's warning that they might be poisoned.[57]

Despite his desire to uncover the source of Mary's prophylactics and antidotes, Walsingham still had his own contacts: one of these was the French apothecary Nicholas Cabry, whom he had known since the St Bartholomew's Day massacre of 1572 (Cabry, along with several other Protestants, had taken refuge in Walsingham's Parisian residence during the first days of the massacre; Cabry never forgot this sanctuary).[58] In one delivery, Cabry sent Walsingham 'unicorn's stone' from Constantinople, which he suggested might be tested on animals that had already been given arsenic, but neglected to include 'Metridec treacle', as he assumed Walsingham already had enough.[59] His next delivery included '½ oz of unicorn's stone, which I have tried', as well as some of the ingredients for making 'the mithridate of damocrat'.[60] Two years later, Cabry wrote to his friend: 'as you are curious about rarities, I send you word that I have got two boxes of treacle of Cairo, the seed of true ammonium, very aromatic, of which I send you a little box. Also a piece of Oriental unicorn horn, weighing seven crowns, much more certain than the common which we use daily'.[61] Cabry's reference to unicorn 'stone' as well as 'horn' points to another material commonly considered proof against poison, the bezoar. Bezoars form in the stomachs of ruminants in much the same way as ambergris in whales and pearls in oysters: indigestible, small irritants such as the beak of a squid and a piece of sand are enough to start the process in the latter beasts, while a bezoar may form around a hairball or other foreign object. Amongst their many supposed properties was the ability to render poison inert, and the bezoar taken from the stomach of a unicorn was, naturally, the most prized of all.[62]

Like her secretary of state, Elizabeth I was a firm believer in the bezoar. When a package of jewels was delivered into the care of Mary Radcliffe, a gentlewoman of Elizabeth's Privy Chamber, it included a 'Bezoar stone set in gold hanging at a little bracelet of a flagon chain', which was 'the most part … spent'.[63] This stone, clasped in gold and dangling on the end of a chain, would have been in prime position to be dipped into whatever beverage the queen had in her goblet, thus neutralising any poison present. That it was 'mostly spent' suggests that Elizabeth trusted few of her drinks. This was perhaps wise, seeing as even Lady Cobham, a lady of her Bedchamber and donator of mithridate to Mary, Queen of Scots, apparently

cared more for the continued health of Elizabeth's enemy than for that of her own mistress.

While Walsingham's men were ransacking Chartley for incriminating evidence following the uncovering of the Babington Plot, they found more than just letters and cipher keys. Listed in an 'Inventory of jewelry, silverware and other small objects' belonging to the beleaguered queen were several items of precautionary ware: objects carved from rock crystal including cutlery handles (rock crystal was believed to shatter or change colour on contact with poison), a bezoar set in silver, 'a black stone, for use against poison, the shape and size of a pigeon's egg, with a protective covering of gold', boxes brimming with other prophylactics including 'coral, terra sigillata, mummy, powder of pearls', and a slice of unicorn horn set in gold on a golden chain.[64] This final piece is a reminder that unicorn horn was a status symbol as well as a valued medicinal tool: like Elizabeth's bezoar, Mary's piece of unicorn horn was attached to a golden chain. Following Mary's execution, her physician carefully guarded a 'little bottle of silver containing a stone medicinable against poison', perhaps the 'piece of an unicorn's horn with a little pendant of gold' bequeathed to her son, King James.[65] Some, such as Paré (who had also served as physician to Mary's *first* late husband, the French king François II), questioned the efficacy of both bezoar and unicorn horn.[66] Such doubts did not stop new pretenders to the panacean throne being regularly mooted: Lancelot Browne, physician to Elizabeth, James and Anna of Denmark, for instance, reported the gallstones of the porcupine (known as 'Lapis Malaccensis, or the stone of Malacca'), as 'preferred far before either bezoar stone or unicorn's horn' in India.[67] The fact that Robert Cecil archived Browne's report carefully amongst his papers suggests that such 'knowledge' was seen as useful intelligence.

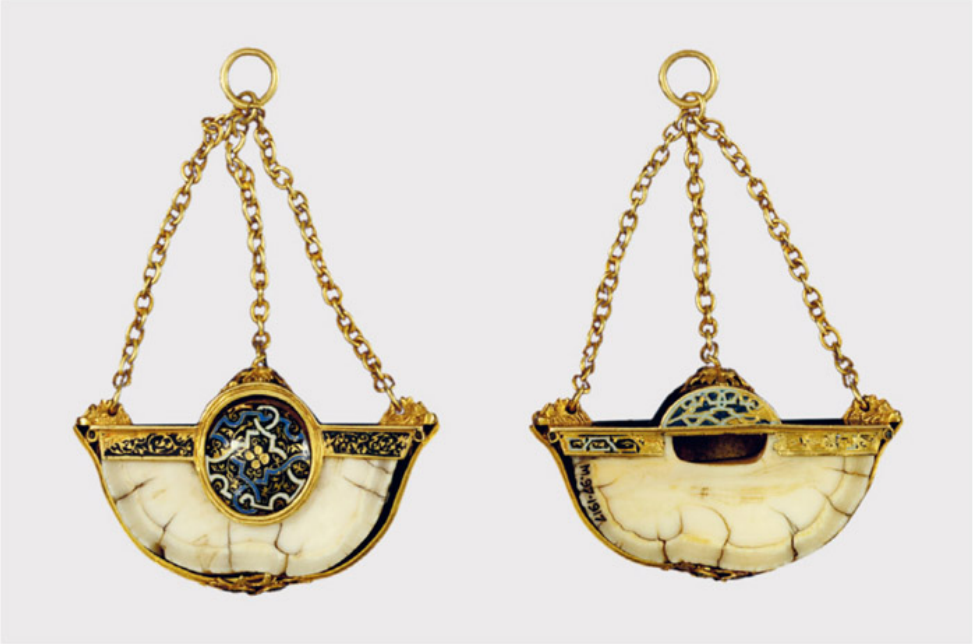

Fig. 55: The ‘Danny Jewel’, an example of a piece of unicorn horn in eminently dippable configuration: it has been suggested that the scratch marks on the back indicate that it saw active service.[68]

POISONS ON TRIAL

While there were many, many substances known to be poisonous, the reasons *why* they were so was much in dispute. Medical knowledge and techniques may have been advancing continuously, but understanding of the efficacy of both poisons and their antidotes was still caught in the twilight zone between magic, tradition and what we now call science. As poisons were also thought to cause diseases, especially plague, panaceas such as mithridate and bezoars were regularly tested in the field, along with other promising elixirs, and reports of their efficacy circulated widely. In 1563, Claudius Richardus, surgeon to the Holy Roman Emperor, Ferdinand I, carried out several experiments on the use of bezoar stone as a treatment for illness, following which he pronounced it ‘a kingly medicine’. Successes such as these were published in books such as *Dos libros*, the 1565 treatise on antidotes by the Spanish physician and botanist Nicolás Monardes. Richardus also took part in several poison trials, a practice resurrected by Pope Clement VII in 1524 at the start of his papacy. Keen to establish the

potency of a new antidote oil created by the surgeon Gregorio Caravita, Clement 'gave' his physicians two condemned men on whom they might conduct a simple experiment. The pair were robustly dosed with wolfsbane (*Aconitum napellus* or *Aconitum lycoctonum,* the former also known as Monk's-hood) and, once it began to take effect, one of them was anointed with the antidote while the other was left to his fate: the untreated prisoner died in agony. A similar test, also successful, was undertaken on a prisoner who had been given arsenic. A pamphlet was soon published trumpeting the virtues of Caravita's new panacea. These successes kicked off a whole series of human trials in Bologna, Modena, Florence, Prague and Vienna. Other poison tests were carried out on condemned criminals, notably by Paré in 1566, not all of which were successful. Often, when antidotes failed (as in a 1561 trial in Prague where the supposed panacea, which had earlier proven efficacious against arsenic, was powerless against wolfsbane), this was put down to their having lost their potency through age, or to their being counterfeit.[69]

Panaceas were also tested at home. Sir Kenelm Digby, the natural philosopher and diplomat who dabbled in alchemy, was a great believer in the medicinal power of the viper, the only venomous snake in the British Isles. The 'quintessence' of viper was considered both a remedy and a preventive measure, such that it 'preserveth from Gray-hairs, reneweth Youth, [and] preserveth Women from Abortion'.[70] Digby was well aware that the viper's therapeutic properties were intimately bound to its more poisonous nature, and thus doubtless took great care in preparing the viper wine his famously beautiful wife, Venetia, drank with enthusiastic regularity. When Venetia died suddenly in 1633, most likely of a cerebral haemorrhage, Digby was convinced that his wine had been the culprit. Others thought the same, but rather than it being an accidental death caused by an error in dosage or preparation, they were convinced that Digby had purposely and slowly poisoned Venetia with the noxious liquid, presumably out of jealousy. These rumours were doubtless tied to Venetia's great beauty – surely such a woman must be obsessed with her looks, and thus irredeemably vain and untrustworthy? Certainly, her habitual partaking of what was plainly a dangerous concoction served as proof of this vanity. Digby's wine became tainted: while he had once proudly shared his recipe

with the royal physician Theodore Mayerne, he would later restrict his championing of the viper as a panacea to its use in the form of a *powder*. He sent his preparation of powdered viper to William Cavendish, marquess of Newcastle, suggesting that it would not only act as an aid to fertility but also a potent stimulant to help him satisfy his wife Margaret, his junior by thirty years. The marquess was disgusted by the hairs mixed in with the powder, which according to Digby were pieces of bone – he presumably would have found Digby's wine equally repellent.[71] The union produced no children other than Margaret Cavendish's many 'paper bodies', her written works. Digby never stopped searching for panaceas, and his book on the so-called 'weapons salve' by which wounds could be cured by anointing the blade that caused them, *A Late Discourse … Touching the Cure of Wounds by Powder of Sympathy* (1658, trans. White), which explained how to effect this cure 'naturally and without any magic', went into twenty-nine editions.[72]

It was not merely antidotes that were tested, however. In the late sixteenth century, a small quantity of suspected poison was 'carefully secured' by one intelligencer, who had intercepted it from a suspected poisoner and offered it to the authorities for testing.[73] Such behaviour was not rare. In 1609, another small phial brought in by one of Robert Cecil's informers was presented to a group of English doctors who proceeded to compare it with other substances found in an apothecary's, using taste, smell and visual inspection (they were presumably quite confident that it was harmless in the first place). Having deduced that it was 'natural balsam of Peru, and no other thing', they put it to one final test, giving some to a small dog which they then kept fasting all night. The dog was unharmed, though had it been poison it was enough, they thought, to have 'killed 5 great dogs, not only one little cur'.[75]

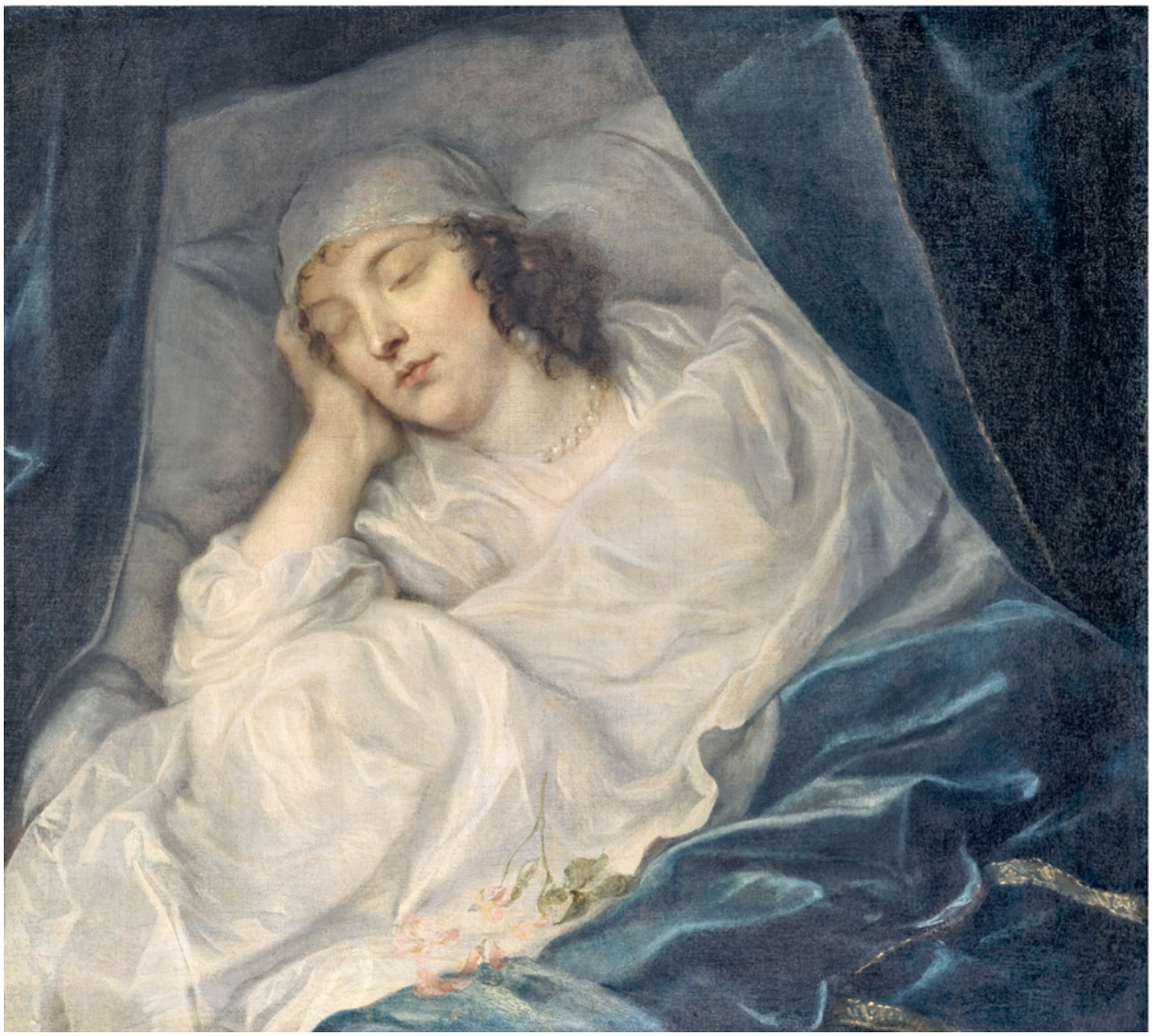

Fig. 56: Venetia Digby on her deathbed. She was thought to have been poisoned by viper wine. The recipe for viper wine circulated in textbooks such as John French's *The Art of Distillation*: 'Take the best fat Vipers, cut off their heads, take off their skins, and unbowel them, then put them into the best Canary Sack; four or six according to their bigness into a gallon: Let them stand two or three months, then draw off your Wine as you drink it.'[74]

Another instance of animals being used to test for potential poison also serves as an excellent demonstration of the deep-reaching fear of the substance. On 5 October 1607, Paolo Sarpi, a Venetian lawyer, historian and prelate (a brother of the Servite Order), was walking home via the Rialto with two companions, a servant and a patrician, when the group were set upon by five stiletto-wielding *bravi*. The men had allegedly been hired on behalf of the Papacy after Sarpi had weighed in on an argument between Rome and the Venetian state. Sarpi survived the attack, something of a

minor miracle as, by his own account, each of the three stiletto wounds he suffered, one of which was to his temple, penetrated 'more than four fingers'.[76] One source records the final thrust as entering his right temple and exiting between his nose and cheek with such violence that not only did it break his upper jaw but the stiletto's long, thin blade was bent in the process. The assassin, unable to remove it, fled the scene, leaving his 'little steel' embedded in Sarpi's skull. Having survived the initial assault, thoughts turned to the possibility of the blade being poisoned, but, once it was removed, Sarpi himself observed that the stiletto lacked the grooves in which he assumed any poison would be secreted (ironically, perhaps, such grooves – missing in this case – were most likely a technique known as cannellation, which served to strengthen a blade, making it less liable to breaking or bending).[77] The Senate were not willing to leave Sarpi's recovery to chance, so decided to send the weapon to a chemist for testing. The chemist stabbed a dog and a chicken with the stiletto removed from Sarpi's skull, and as neither died from their wounds, declared him free from risk of poison.[78]

SPREADING THE POISON

In his *Institutes of the Lawes of England*, the great lawyer Edward Coke listed four ways in which poison might be administered to a target: '*Gustu*, by taste … *Amhelitu*, by taking in of breath … *Contactu*, by touching: and lastly, *Suppostu*, as by a glyster [i.e., enema] or the like.'[79] The last method was rare but had been used in the murder of Sir Thomas Overbury in 1613. Coke had been deeply involved in the subsequent trial, which is presumably why it makes an appearance here despite its uncommon nature. Taste, scent and touch were vehemently guarded against, however. The 'Certain Cautions for the Queen …' did not merely recommend the regular ingestion of prophylactics, and that only food hailing from inside the court, or with spotless provenance, was to be consumed, but sought to shut down other pathways to the monarch. 'Your Majesty's apparel [i.e., clothing], and specially all manner of things that shall touch any part of Your Majesty's body bare' were to be carefully inspected and handled only by trusted

individuals. Naturally, it was difficult to control every gift brought for Elizabeth, but a compromise was suggested: ‘no manner of perfume either in apparel or sleeves, gloves or such like, or otherwise, that shall be appointed for Your Majesty’s favour, be presented by any stranger, or other person, but that the same be corrected by some other fume’.[80] That is, perfumed gloves or sleeves given as gifts should be fumigated – gloves were routinely perfumed to counteract the stink of stale urine impressed on the leather during the tanning process, and the suspicion was that these fresh scents might do rather more than simply mask the stench: they might serve to conceal poisonous intent. The queen had taken this seriously enough in 1563 to give her personal perfumer John Wyngard a ‘steel perfuming pan’ with both ‘lock and key’ so that nobody but he could handle it.[81] In France, Catherine de’ Medici, the Italian wife of King Henri II, was gaining a reputation as having something of a poisonous influence on the French court. Named in libels as ‘Madame la Serpente’, she, alongside her ladies-in-waiting, was held responsible for several political poisonings in the late sixteenth century (though such accusations seem to be more the result of misogyny and xenophobia than of any actual evidence).[82] One of her entourage considered especially bad company was the Florentine perfumer René Bianchi, a specialist in scenting gloves who was widely suspected to be an expert with poisons. Poison, perfume and gloves were linked by an intelligence report, which suggested that poison applied to gloves took effect not by direct contact with the hands, but by the victim’s ‘smelling’ the fashionable handwear.[83]

The fear of gloves may have been well founded. The method had certainly reached the shores of England by July 1595, when the physician Dr Wood was imprisoned and lost his ears for the forgery of a document – handwriting, signature, seal and all – that provided him with an annuity on the death of his employer, Gilbert Talbot, 7th earl of Shrewsbury. Wood was confident of Shrewsbury’s imminent demise: egged on by the earl’s brother Edward, he planned to effect just such an event through ‘works of darkness being done in secret’, in this case by poisoning the earl’s gloves.[84] The dark hand of the poisoner was seen lurking in every shadow, and when even the very air Her Majesty breathed was potentially dangerous, times were bad

indeed. The fear was so great that poison and perfume were regularly conflated.

'God forgive me if I judge amiss', wrote one man in 1584, 'in seeing Charles Arundell [recusant and suspected spy for the Spanish only recently released from the Tower] provide gloves & sweet savours at a new perfumer's house in Abchurch Lane of late, if I did not fear some poison towards Her Majesty. She having her senses of smelling so perfect, & delighted with good savours.'[85] In 1587, Robert Dudley, 1st earl of Leicester, received a letter in which the imprisoned sender boasted of his knowledge of making 'mortal poisons and perfumes'.[86] Paré knew of a man who had put a 'secretly poisoned' pomander to his nose; his 'face swelled' and he would surely have died were it not for the remedies provided.[87]

A more detailed and direct report of the possibility of poisoning through breath was provided by Robert Wayland in 1599, buried within the litany of accusations he made against Sir Walter Leveson of Lilleshall Abbey, MP for Shropshire and latterly Newcastle-under-Lyme. Though hardly a spy, Leveson was a guest at the Fleet debtor's prison. According to Wayland, Leveson had 'put in practice a perfume to be made that would poison these that should smell thereof as they should lie in their beds', noting that the distillation apparatus had melted during the manufacturing process and fumes from the resulting chemical spillage had almost poisoned 'Richard Swanton, one of Her Majesty's messengers'.[88]

Wayland was prevailed upon to purchase various such 'things of venomous quality as the powder of glass, ratsbane [arsenic], or Seneca [presumably hemlock]'. Meanwhile, Leveson's solicitor and apparent tutor in all things poisonous, George Shepherd, encouraged him to buy books such as 'Arnaldus de Villa Nova's *de Historia Plantarum*', 'his 9 books de Venemin … better to understand how to put in execution his ungodly practices'. Leveson, intent on becoming self-sufficient in such matters, planned his own poison garden using 'diverse roots and seeds' given him by Shepherd, as well as plants such as 'conitum' (most likely wolfsbane), 'carula' (probably *Passiflora caerulea*, the passion flower, which contains cyanogenic glycosides that can lead to cyanide poisoning) and 'mandray' (mandrake, a poisonous, hallucinogenic plant associated with witchcraft), as well as 'certain [other] things to make a perfume of a venomous quality'.[89]

Another of the reasons that perfumers, with their secretive ways and distillation equipment, were often conflated with poisoners was the common distaste felt for the use of anything that masked one's true nature, such as cosmetics – this common understanding presumably exacerbated the accusations made against Digby following his wife's demise. Medicine, by way of contrast, was thought to work by balancing the four humours (yellow bile, blood, black bile and phlegm, which in turn represented the four qualities, namely heat, cold, dry and wet), thus returning the body to its 'true' state.[90] There were other forces at work, however.

A TOAD, BY ANY OTHER NAME

One of the mechanisms thought to be behind the operation of antidotes were the occult virtues of sympathy and antipathy. Sympathy was a natural-philosophical concept which described the inner links between all things, a sort of mutual attraction that could be put to use in magic or healing. Antipathy was, quite reasonably, its opposite; a mutual repulsion. An antidote which relied on antipathy worked by repelling the poison, and once taken internally would expel it from the patient's body; one relying on sympathy attracted the poison, so when applied externally would draw it from the body. The manner in which your antidote worked was thus of no little importance. An antidote that worked through sympathy, for example, ought not be taken internally, as this kept the poison from leaving the body, with predictably disastrous results. Sources sometimes disagreed on which antidotes worked through which quality, however. The powers of sympathy also explained those situations in which a substance could work both as a poison or as a cure, depending on situation and patient. Theriac, for example (a prime ingredient of which was viper flesh, which, as Sir Kenelm Digby could attest, seemed as dangerous as it was beneficial) would itself act as a poison if administered erroneously.[91]

The close relationship between some poisons and their antidotes was writ large in the humble toad which, in common understanding, provided access to both: as Duke Senior remarks in Shakespeare's *As You Like It*, 'Sweet are the uses of adversity, / Which, like the toad, ugly and venomous,

/ Wears yet a precious jewel in his head'.[92] The 'jewel' thought to reside in the toad's head was precious not least because it was reputed to act against poison. In 1569, the French humanist Pierre Boaistuau, for instance, wrote that 'In another country of the *Indians* is found a stone in the heads of old and great toads … which some affirm to be of power to repulse poisons'.[93] Paré disagreed: 'the vulgar opinion is false, who think that the toadstone is found in their heads, which is good against poison'.[94] This 'vulgar opinion' was still being aired by Thomas Lupton in 1579, however, who cited the Dutch physician Levinus Lemnius when writing 'A toadstone … touching any part [that] be venomed, hurt or stung with rat, spider, wasp, or any other venomous beast, ceases the pain or swelling thereof.'[95]

Opinions varied as to how a toad might be invited to relinquish its precious cargo. Lupton recommended placing a lightly bruised toad in an earthenware pot and burying the pot in an anthill: the ants would eat the toad's flesh, leaving the stone behind.[96] Edward Topsell suggested a rather more polite method – the toad would happily give up its stone if placed on a cloth 'the colour of red scarlet', he stated, though care must be taken to prevent the toad from immediately re-ingesting it. A true toadstone, Topsell suggested, would change colour in the presence of poison or, if held in the hand, would burn it. He also provided another handy test to ensure a stone's authenticity: 'the probation of this stone is by laying of it to a live Toad, and if she lift up her head against it, it is good, but if she run away from it, it is a counterfeit'.[97] That toadstones were, in fact, the fossilised, button-like teeth of long-extinct fish did not stop them from being made into rings or amulets.

Fig. 57: A ring from the Cheapside Hoard, which could easily be mistaken for a toadstone, as it shows one of the features noted in Topsell's *History of Four-Footed Beasts*, namely its having 'naturally engraven the figure of a Toad'.

Fig. 58: A ‘frog pouch’, a fashionable item of the latter half of the seventeenth century, easily attached to a she-intelligencer’s dress. Designed to hold fragrances (the mouth’s opening only allows for the tip of a little finger), they may well have borrowed the toad’s aura: scent, like the toadstone, was held to protect against poisonous fumes. Six of these toad-sweet bags have been identified in museum collections, all with an English provenance: they closely resemble other *English* needlework styles despite the foreign origin of the silk materials.[98]

While the toadstone and its supposed powers as a panacea were somewhat overstated, it was certainly true that a poison could be extracted from the warty amphibians, one which, according to Paré, saw its victims ‘taken with a sudden *vertigo* ... they fell into a swoon, intermixed now and then with convulsions. But they stammered with their lips and tongues becoming black; a froward and horrid look with continual vomiting, and a cold sweat, the forerunner of death, which presently seized upon them, their bodies becoming exceedingly much swollen’.[99] Of the many misdemeanours Wayland placed at Leveson’s door in 1599 was his facility for extracting the toad’s poisonous virtue. He told of how Leveson would ‘put a toad called Rubata into the cup’ which he would then heat, drawing the poison from the toad such that ‘whoever drank of the same cup should

be poisoned' (a technique that might have been familiar to Shakespeare's Hamlet). Wayland detailed another technique – again framing the luckless toad as some sort of familiar by naming it (he presumably confused the Latin word for a type of poisonous toad, *rubeta*, with an actual toad, or might have been taking a sly dig at Robert Cecil) – which involved poisoning salt 'by putting the Toad Rubata in a bag amongst salt and drying it, at the fire, she being in the bag'.[100] It is a reminder that toads, like the mandrake in Leveson's garden, were also associated with witchcraft.[101] Following Juan de Jáuregui's botched attempt on the life of William the Silent, rumours were spread that the failed assassin had not merely been armed with a handgun, but also carried both dried toads and poison about his person.[102]

Knowledge of poisons and antidotes was based largely on ancient authority, notably Pliny the Elder's *Naturalis Historia* and more dedicated texts such as the sixth-century Greek physician and philosopher Galen's *De Antidotis*, and *De Theriaca ad Pisonem*, of contested authorship, published in 1531. According to Galen, poisons such as mandrake, opium and hemlock had natures which were opposed to that of the human, and had their effect because their 'specific form', or 'total substance', as it was known, changed the human body when administered.[103] This reaction differed from disease, which was the result of an imbalance of the four humours, though symptoms of poison and disease might resemble one another.

For Paré, symptoms themselves could be traced to the 'manifest and elementary qualities' of the poison itself. Arsenic, mercury sublimate and verdigris, for example, caused 'in the stomach and guts intolerable pricking pains, rumblings in the belly, and continual and intolerable thirst. These are succeeded by vomitings, with sweats some whiles hot, somewhiles cold, with swoonings, whence sudden death ensues' – indications of an excess of heat aligned with a corrosive quality. Hemlock, henbane, opium and the like worked through coldness, and would thus 'induce a dull or heavy sleep, or drowsiness … cold sweats, their faces become blackish or yellowish, always ghastly, all their bodies are benumbed, and they die in a short time unless they be helped'.[104]

Other than Leveson's seed catalogue, another list of poisons commonly in use was provided by Coke, and it was remarkably similar to the litany of substances thought to have been administered to Overbury: 'powder of Diamonds, the powder of Spiders, Lapis causticus (the chief ingredient whereof is Soap), Cantharides, Mercury Sublimate, Arsenic, Roseacre, &c'.[106] Paré, on the other hand, organised his lists not by recent use, but by source: 'Minerals or metals are either so taken forth of the bowels of the earth, or else from furnaces. Of these many are poisonous, as arsenic, sublimate, plaister, ceruse, litharge, verdigris, orpiment, filings of iron, brass, the lodestone, lime, and the like.'[107]

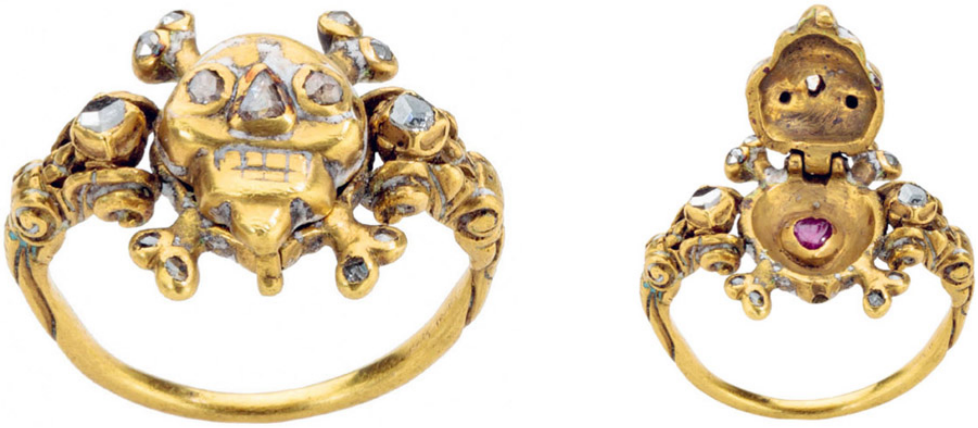

Fig. 59: A poison ring. Though more commonly meant for relics such as the hair of a loved one, the secret compartment also made them perfect for surreptitiously delivering poison into a glass or other receptacle. A seventeenth-century musician found a way for the two uses to work in harmony: 'get a ring that is hollow made, either of metal or red Horn, then take a piece of Snakes-Skin, that has been steep'd in the juice of Nightshade … and draw it into the hollow of that ring, as you would do hair, and whoever wears it, will be in love with you, by a secret and magnetic power'.[105]

Paré's apparent obsession with poisons was perhaps related to the fact that in both his home country, France, and in Italy, birthplace of Catherine de' Medici, poisoning was practically a national pastime. In Italy, traveller Raymond noted the expertise of the natives and their 'curious (yet illegal) tricks in poison, some mortal by smelling so, others that given now, shall have no operation till many months after'.[108] A few years after Raymond's sojourn, a group of five women in Rome began selling poison to wives who wished to rid themselves of their husbands, leading to the death of dozens of men before the cabal was broken. Legend has it that the poison recipe they shared was called 'Aqua Fontana', but in the 1,450 pages of

confessions the women merely referred to it as ‘aqua’. To make it, one said, take ‘two ounces of arsenic and one grosso [either 10 grams or a few pennies’ worth] of lead and grind them together. Then fill a new water jar that holds a little more than [0.75 litres] and add the ground arsenic mixed with the lead bird shot’. Another revealed the secret ingredient, boiled toad, and the antidote, vinegar.[109] In France, several decades later, the fortune-teller and poisoner Catherine Deshayes, aka ‘La Voisin’, and her associates caused havoc at the French court.[110] In England, however, fear of poison far outstripped its actual use.

POISONOUS PLOTS, AGENTS PROVOCATEURS AND TALL TALES

The final decades of the sixteenth century and the first decades of the seventeenth were, as we have already suggested, prime years for the development of English espionage in both theory and practice. With the country seemingly beset by enemies – besieged by Catholics abroad and infiltrated by Catholics at home – plots, conspiracies and counter-espionage were writ large in English life. While poisons and their antidotes could be discovered in medical textbooks, once they had been bought in the apothecary’s shop or foraged in the wild and suitably prepared, they still had to be administered. Most of the ways in which they were thought to be delivered to their target were explained in interrogation reports.

While the carefully worked exposure of the Babington Plot had provided Walsingham with all he needed to finally dispose of Mary, Queen of Scots by way of the legal system, the continued presence of French ambassador Châteauneuf (Castelnau’s successor) remained a thorn in his side. France was unlikely to allow England to execute a member of its royal family without protest, and Châteauneuf was in a position to make such a move diplomatically impossible. To ensure that the upcoming trial would be Mary’s last, Burghley and Walsingham needed to get the French ambassador out of the way. The method they chose was poisonous, but rather than actively poisoning Châteauneuf, they sought instead to implicate him in a conspiracy to murder by poison, one they could promptly, and

publicly, foil.[111] All they needed was a suitable individual to carry out their plans.

In 1585, Walsingham had received a letter from Dieppe in which the writer thanked him for 'excusing me unto my mother'. It is unclear why this man was so grateful, but grateful he was: 'there is no man living to whom I am beholding but yourself. If I should live to see my blood shed in your honour's cause I should think it but some recompense for the great good I have received at your hands'.[112] He was William Stafford, the eponymous 'villain' after whom the subsequent plot became known. Walsingham's man through and through, it was time to repay his debt.

In December 1586, Stafford paid Châteauneuf a visit, presenting himself as one disaffected with the English (and, by implication, Protestant) authorities – he had, he explained, become rather unpopular with Leicester, who also happened to be Elizabeth's favourite. Not wishing to live under such a cloud of opprobrium, Stafford suggested that he join the retinue of visiting diplomat Monsieur Pomponne de Bellièvre and thus enjoy safe passage to France. The French ambassador, sensing an opportunity, asked Stafford whether there was 'nobody that for renown will do an exploit?' On asking what exploit he referred to, Châteauneuf replied directly: 'to kill the queen'.[113] Stafford said that he knew of such an individual, namely his brother's man, Michael Moody, then luxuriating in Newgate on account of debt. Persuaded there was still hope for such a mission, and that with one last, brave roll of the dice they could turn the tables on Walsingham, the Frenchmen wandered into his trap.

Unfortunately for Châteauneuf, Stafford was an agent provocateur, and promptly took the ambassador's secretary, des Trappes, to Newgate prison, where he introduced him to the would-be assassin. The ambassador was past the point at which he could hope to protest his innocence. In Newgate, Stafford asked Moody how, exactly, he proposed to assassinate Elizabeth, recounting the answer in his later examination: 'with poisonings of her stirrup, poisoning her shoe, for sayeth he "I am very well acquainted with her shoemaker", or by laying a train of gunpowder where she lieth to blow up the chamber and all that be in it … they were pretty devices'.[114] Pretty or not, they were theoretical – Stafford poured cold water on Moody's more explosive idea on account of his mother being one of Elizabeth's ladies of

the Bedchamber, but that was more performative than practical, as he already had the ambassador hook, line and sinker; the sting was complete. In what was perhaps a final irony, however, Moody's 'pretty devices' may well have hailed from across the channel.

The *Workes* of the French surgeon royal Paré, published in 1575, contain much information about poison. In the section dealing with poisons delivered via the air (against which the best defence was, apparently, 'not to smell them'), Paré noted reports of substances that 'if you but anoint the stirrups therewith, they will send so deadly poisonous a quality into the rider, through his boots, that he shall die thereof within a short time'. The fact that they did not touch the skin was of no matter, as nature provided its own example, namely the 'Torpedo', a fish which could transmit 'a narcotic, and certainly deadly force' into a fisherman when they were connected only by the net.[115] It does not take a great leap of imagination to conclude that Moody's plan to do away with Elizabeth 'with poisonings of her stirrup' or by 'poisoning her shoe' came directly from a textbook.

Stafford was committed to the Tower, and while one might have expected a man who had admitted to leading a conspiracy to assassinate the queen to quickly lose all connection to his innards, he was released without charge some eighteen months later. Once again, Walsingham had created a plot in the absence of a conveniently real one. The Stafford Plot not only provided the final justification for the execution of Mary, Queen of Scots, namely that she had 'conspired with Her Majesty's subjects to have had her murdered, in the field, in the Chamber, in her bed, with daggers, with pistols, with poison or any other ways', but also allowed for the temporary incarceration of Châteauneuf and his secretary, thus neutralising any potential French protest or retaliation.[116] They were released two months after Mary's execution.

Concocting plots and conspiracies involving poison was not only useful when seeking to remove a problematic individual such as Châteauneuf; it was also good for demonstrating one's dedication and utility to Her Majesty. Walsingham finally passed on to the great spy network in the sky in 1590, leaving the 2nd earl of Essex and Burghley in a frantic race to fill his shoes. Burghley, however, was in the process of stepping back from public life, leaving his son, Robert Cecil, increasingly in charge of affairs of

state, much to Essex's chagrin. Having acquired some of Walsingham's most valuable intelligencers, including the Bacon brothers and Thomas Phelippes, Essex, who had been appointed privy councillor in 1594, decided to take matters into his own hands. After all, he had married Walsingham's daughter Frances, the secretary's only surviving child, so doubtless felt this was his late father-in-law's legacy, justly claimed. It was time to engineer a political coup. At the centre of his scheme was Roderigo Lopez, Elizabeth's personal physician and, as luck would have it, a *converso*, that is, a Portuguese Jew who had converted to Christianity. How better to prove one's worth than by foiling a threat to the queen from within her closest circle?

The initial ammunition against Lopez was provided by a correspondence with Spain intercepted by Phelippes, and by the arrest and interrogation of the couriers who enabled it. Once they had implicated Lopez, Essex immediately crowed that 'I have discovered a most dangerous and desperate treason. The point of conspiracy was Her Majesty's death. The executioner should have been Dr Lopus. The manner by poison. This I have so followed that I will make it appear as clear as the noon day.'[117] Once Essex had turned against him, the matter was as good as settled. A brief trial followed, during which much was made of Lopez's Jewish roots.[118] Found guilty, he was hanged, drawn and quartered alongside his three supposed 'co-conspirators' at Tyburn in June 1594. The evidence against Lopez may have been slight, but Essex's need for a public 'win' was great.

While the Lopez affair was not a confection in the manner of the Stafford Plot, as it had its roots in opportunism rather than straightforward entrapment, it suggested that Essex had learned something from his father-in-law with regard to the efficient use of fear, and especially fear of poison. To add to the weight of import, Essex's intelligencer Francis Bacon wrote 'A True Report of the Detestable Treason, Intended by Dr. Roderigo Lopez'. While it remained unpublished until 1667, its original intention was clear: to make public the depth of the conspiracy Essex had foiled, and so add to his reputation and authority as a new master of intelligence. Poison, or the fear of it, was once more a weapon wielded to win reputation and promotion rather than one actually used to effect assassination. This was a

lesson Robert Cecil took to heart, and when, a few short years later, bereft of a solid conspiracy with which to further discredit his queen's Catholic enemies and prove that only he, not Essex, could fill his father's shoes (Burghley had died in August 1598), he immediately concocted one, the Squier Plot.[119]

NO GREATER THAN A BEAN

On 29 January 1598, Sir John Stanhope, Elizabeth I's treasurer, received a bill of £4 18s for 'the diet, lodging and other expenses' pertaining to a seven-week stay in the Compter prison, Wood Street, by Edward Squier. Squier's sojourn had ended when he was transferred to the Tower, and he was subsequently 'executed for some lewd & notorious practice pretended by him against Her Majesty's person'.[120] The court gossip John Chamberlain told his friend Dudley Carleton that Squier, 'being in Spain … [with] one [Richard] Walpole, a Jesuit', had gone 'with the earl [Essex] in his own ship the last journey, and poisoned the arms or handles of the chair … as likewise he had done the pommel of the queen's saddle', but in vain.[121]

It had all started when the Protestant Squier joined an expedition by Sir Francis Drake, then was captured and taken to Spain. It is unclear whether he converted, or whether in return for his release he peddled tales; he in any case promised Jesuits in Seville that he would return to England and there turn assassin. Squier might have had no previous experience as a poisoner, but he soon told his Jesuit handler Richard Walpole of his skill in making perfumes, recounting how he had 'read in Tartalia [i.e., possibly, Nicolo Tartaglia] to make of a ball, the smoke whereof would make a man in a trance & some to die'. Considering this method overly convoluted, Walpole suggested that 'to apply poison to a certain place is the convenientest way'. Squier was given a recipe to follow, and advised to take care not to raise suspicion by purchasing all of the ingredients together. Perhaps overly careless of being discovered, or simply lazy, Squier 'bought 2 drams of opium & 5 drams of mercury water at a pothecaries shop in Paternoster Row towards the further end near Doctor Smith's house'.[122] He then

sourced the other three ingredients (which he described as ‘such as might be beaten to powder; … called by Latin or Greek names; … the whole composition was not above the bigness of a bean’, and as costing 8 pence all together) in ‘a potecaries in Bucklersbury at the Plowe’ and in ‘a potecaries shop in Newgate Market’. He mixed the poison, left it to cure as instructed, and tested it on ‘a whelp of one Edwards of Greenwich’. As he never saw the beast again, he presumed it had died.[123]

Squier’s first target, or so the story goes, was Queen Elizabeth, for whom he abused his position as one of her equerries. Before the queen went riding, he approached her horse, and ‘laid his hand on the pommel of the saddle and out of a bladder, which he had made full of holes with a big pin he impoisoned the pommel & the saddle being covered with velvet by brushing the poison in it through the holes of the bladder with his hand and soon after Her Majesty rode abroad that afternoon’. Assuming the poison would soon be transferred to the queen’s mouth as planned, Squier set off to the Azores with Essex, this time carrying his poison in a ‘little earthen pot of a zell [i.e., even] colour glazed within, with a narrow mouth, which he stopped with cork’ in ‘his portmanteau’. Within days he had applied the poison, ‘clammy as it would stick to the pommel of the chair’, rubbing it ‘where he [Essex] did use to sit & lay his hand’ using a piece of parchment. Squier was arrested on his return from the Azores, after a journey during which Essex had remained stubbornly impervious to the parchment poison which had presumably remained on his pommel throughout.[124]

Following Squier’s execution, an anonymous pamphlet entitled *A Letter Written out of England to an English Gentleman Remaining at Padua* was published detailing the whole affair. It received several responses from exiled Catholic writers, including Martin Aray, whose *The Discoverie and Confvtation of a Tragical Fiction, Devysed and Played by Edward Squyer* (1599) not only exposed the entire plot as a fiction, but also identified the author of *A Letter* as ‘Master Smokey Swine’s-flesh’, that is, Francis Bacon. Bacon’s ‘letter’ was no such thing; it was rather a piece of propaganda intended to smooth the creases from the government’s handling of the case and lay the blame squarely on Spain and the Jesuits.[125] Squier was most likely innocent of the charges laid against him, the plot contrived by Robert Cecil to assert his authority following the death of his father.[126]

Just because the Lopez and Squier affairs saw poison used as propaganda did not mean that it was never actually put to nefarious usage, however. One of the most notorious poisonings to take place in England was that of the poet Sir Thomas Overbury in 1613.

POISONOUS FAVOURITISM

Overbury was a close friend of Robert Carr, favourite of King James (who made Carr privy councillor and Viscount Rochester in 1611, and 1st earl of Somerset in 1613). When Carr began an affair with Frances Howard, wife of the 3rd earl of Essex, Overbury initially appeared in the role of Cyrano. His facilitation soon turned to disapproval once the possibility of Frances being granted a divorce so that she might marry Carr reared its adulterous head. His presence in court proving a barrier to a union much desired by Carr, Frances Howard and her family, and having refused an offer of an ambassadorship, Overbury was committed to the Tower. Five months later, he was dead, but not before he had been wracked with fevers, fits of vomiting and a raging thirst. It would take two years before rumours that his death had been illicitly procured became loud enough to see the lieutenant of the Tower Sir Gervase Elwes, the jailer Richard Weston, the physician James Franklin and the lady's maid Anne Turner accused of poisoning him. They had done so, it was alleged, at the behest of Frances Howard. Frances, by now married to Carr, was countess of Somerset. This was no spurious accusation.

Franklin gave testimony that Mrs Turner had asked him for 'a poison, that should not kill a man a presently, but to lie in his body for a certain time, wherewith he might languish away by little and little'. He procured some aqua fortis (nitric acid) which she tested on a cat. It 'languished, and pitifully crying for the space of two days, then died', so the countess deemed this method too violent. Franklin said the same of arsenic, so she sent him to buy some powder of diamonds.[127] Eventually, he bought 'many poisons, that is to say, aqua fortis, mercury water, white arsenic, powder of diamonds, lapis cosmatis, great spiders and cantharides'. There followed, he confessed, a concerted attempt to do away with Overbury, primarily by

adulterating his food. When Overbury requested pork for dinner, they 'provided him a pig, and in the sauce they put white arsenic', but their victim 'did eat neither broth nor sauce for the most part'. Next they tried lacing his salt with arsenic, but that also failed, so when he was served partridge with water and onion sauce, 'cantharides, being black, was strawed therein instead of pepper'.[128] Though he began to ail, Overbury stubbornly refused to die; he was perhaps aware of Paré's warning that 'such as fear poisoning, ought to take heed of meats cooked with much art, very sweet, salt, sour, or notably endued with any other taste'.[129] Finally, so the confessions alleged, an apothecary's boy was contracted to administer the coup de grace, the indignity of a fatal enema performed with mercury sublimate.[130]

The four non-noble conspirators were executed; the earl and countess of Somerset lost their reputations, but held onto their heads. Doubts remain as to whether Frances truly intended to murder Overbury, or, indeed, whether his untimely and unpleasant death was the result of poison or chronic ill-health exacerbated by the less-than-clement lodgings and poorly considered self-medication. The timing may have been coincidental, but, within two years of the court case, measures were taken to assert better control over the supply of the sorts of substances used by poisoners – substances that were, of course, also put to therapeutic use. In 1617, King James approved the creation of the Worshipful Society of Apothecaries, and the following year saw the first publication of *Pharmacopoeia Londoniensis* (*The London Dispensary*) by the Royal College of Physicians. The *Pharmacopoeia* was a list of all known drugs, setting out their effects and use – if it was not listed in the *Pharmacopoeia*, it was licensed neither for use nor sale. In 1649, Nicholas Culpeper published an English translation, *A Physical Directory*, which included uses of the various preparations, making this knowledge far more easily available. Culpeper even included a recipe for theriac or treacle. The Royal College was not amused with this threat to their monopoly of pharmaceutical knowledge.

TOXIC RUMOURS

In his *Institutes of the Lawes of England*, Coke wrote that of all the ways in which murder might be prosecuted, poison was 'the most detestable of all, because it is most horrible, and fearful to the nature of man, and of all others can be least prevented, either by manhood, or providence'. For a short period in the sixteenth century, the punishment for such an offence in England was particularly brutal, even for an age not noted for its squeamishness: 'This offence was so odious, that by Act of Parliament it was made High Treason, and inflicted a more grievous and lingring death then the Common Law prescribed, viz. That the offender should be boiled to death in hot water.'[131] As the offence was thus considered graver than other modes of murder, it gave the authorities licence to pursue suspected poisoners more vigorously.

For all the manuals such as the *Pharmacopoeia* and experiments by men such as Paré, poison never quite shook off its devilish reputation. One informer told of a preventive measure that would literally work like a charm: simply utter the word 'Egaldarphe' three times before taking a sip of wine, and if it were poisoned the glass would break; if the cup were silver, it would 'froth or fume'.[132] This claim encapsulated all that was feared about poison – its readiness to adopt the form of any substance it was mixed with made it difficult to detect, and one's best chance of avoiding it may very well have been witchcraft and occult knowledge. These same qualities meant that fear of poison was endemic, and could be whipped up by the Walsinghams of the world in order to justify their less-than-savoury actions; invisible until actually used, poison was the perfect substance to place at the centre of an equally invisible conspiracy which could then be very publicly foiled. Through subterfuge, misinformation and a little judicious torture, poisonous confessions could be extracted from prisoners in order to further a spy chief's political ends: the fear and revulsion poison plots attracted offered an invaluable way to assassinate an individual's character. Later in the century, the public caught on, and used similar unfounded accusations to damage the reputation of first their king and then the royal favourite. Many suspected that the death of Prince Henry in 1612 was due not to typhoid, but to an unknown poison administered by his father, King James VI and I; the death of King James of old age and decrepitude in 1625, meanwhile, led

to loud mutterings that his end had been hastened by the duke of Buckingham's poisonous, and unseemingly personal, attentions.[133]

Dangerous as it was, poison's true efficacy as a spycraft technique may well have been in the opportunity it presented to lay claim to the narrative rather than in its utility as a fast, efficient and practically invisible tool of *actual* assassination. Poison may have been an excellent tool for a spy, but fear of poison was the perfect paranoia to put to use in counter-espionage operations. For a trade that dealt in subterfuge, dissimulation and double-crossing, poisonous whisperings were second nature, and these whisperings would often continue long after death, and needed nothing so solid as evidence to support them. Like all truly effective invokers of fear, poison's power to invoke paranoia lay in the simple fact that poisons existed and could be found and administered with relative ease, if one had a mind to do so. The power of poison to create waves of fear in the public also had the spy chiefs themselves terrified, however. Walsingham wanted unicorn horn as badly as Mary, Queen of Scots.

CODA: THE BLACK CHAMBER

The act of spying is perhaps more associated with the ethereal than the physical – the world it conjures is one of snippets of overheard conversations and shadowy figures disappearing into the mist. The currency of the spy was information, and while eavesdropping was probably the most common method of gathering such material, there were safer and more efficient ways than hiding behind the doorways of taverns frequented by people of suspicion. Information was always at its most vulnerable when in transit, and the most common method of communicating over distance was through the humble letter, and the letter was anything but ethereal – what appear so often as flattened, featureless sheets of paper were in truth multidimensional items. Writing a letter in the sixteenth and seventeenth centuries was a relentlessly physical activity. It involved manipulating paper, quill and ink, folding techniques and seals; counterfeiting a letter could also incorporate the imitation of handwriting, the use of ciphers, codes, disguises, invisible inks, cunning methods of delivery, and even poison. As the letter was the most important artefact produced by spies, it was also the artefact most targeted by counterspies. Mastery of the letter's physical characteristics could therefore be the difference between the success or failure of a conspiracy or counter-espionage operation – it is no hyperbole to suggest that the spy's ability to manipulate these features could mean the difference between life and death.

The story of (English) spycraft from 1558 to 1660 is one of missed opportunity, of a movement away from the patronage-based systems of the sixteenth century and its encouragement of competition – rather than co-

operation – that had led to innovations such as Gregory's perspective box fading into the mists of time, rather than changing the face of counter-espionage. It is also the story of the rise of a new style of intelligence office, the so-called 'black chamber', which presented an opportunity for these techniques to be committed into an institutional memory, and for the establishment of a more co-operative and effective secret service.

THE BLACK CHAMBER

Despite Arthur Gregory's repeated pleas for a more settled place of operations such as a desk in a room in the Tower, counter-espionage in the late sixteenth and early seventeenth centuries was a largely peripatetic occupation. Dark artificers such as he were sent to where the action was – Gregory was dispatched to join Phelippes at Chartley during the last spasms of the Babington Plot, for instance. This was because when correspondence was intercepted by the authorities it was generally at source, taken directly from its supposedly foolproof hiding place, stolen by an embassy mole, or perhaps handed over by an outwardly sympathetic jailer. If time permitted or expediency demanded, experts were consulted. When Walsingham or the Cecils found themselves in need of Gregory's delicate touch with a seal, they found him at his 'poor house' in Whitechapel, or else sent him the seals to counterfeit. When they needed a hand imperceptibly imitated, they might have sent for Peter Bales at his scrivener's shop in the Old Bailey district. When they needed a cryptanalyst, they sent for Phelippes – latterly, Robert Cecil sent whatever ciphers were in need of cracking to whichever debtor's prison his choice cryptanalyst was at that point gracing with his presence (in a way, Phelippes's incarceration was quietly convenient for the secretary of state). Counter-espionage operations were conducted on an ad hoc, mission-to-mission basis, and generally coalesced around high-value individuals, such as Mary, Queen of Scots or Henry Garnett. While this mode of operation worked reasonably well, and occasionally agents provocateurs were used to construct conspiracies as entrapment, it was at heart a reactive system: it only swung into action once a conspiracy had been discovered. It relied, therefore, on traditional espionage techniques

such as betrayal and infiltration. The various competing spy chiefs were always chasing the game.[1]

By the 1630s, a system that made better use of counter-espionage resources such as Gregory and Phelippes had developed in Brussels, the heart of the Spanish Netherlands, though it was aimed at reaping secrets for financial rather than political gain. Alexandrine of Rye-Varax, countess of Taxis, was employing a new method of monetising her family's monopoly of the continental postal service. The Taxis family (later Thurn and Taxis, whose descendants still run the German postal system) were appointed as postmasters of the Holy Roman Empire by the Catholic Habsburg Emperor and commanded most of the postal routes in Western Europe, including those from the continent to England. When Alexandrine was widowed, she took over the family business in her son's name, and transformed some of her postal offices into spy hubs. This kind of intelligence unit would much, much later come to be known as a *cabinet noir*, or 'black chamber'.[2] A black chamber was, in effect, the place where letters were interrogated – the information gleaned from these interrogations was then stored in order that it might be referred to later, whether in a legal court or otherwise, by way of comparing ciphers, cross-referencing suspicious names, and so on. A black chamber created its own papertrail. The individuals who worked within this hidden office were polymaths, scribes, cryptanalysts and technicians, each of whom had their own, particular task – copying at speed, translation, codebreaking, mixing inks, or forging the various marks that authenticated a document (seals, handwriting, signatures, letterlocking). Whereas Gregory and his ilk protected their secrets jealously, and thus almost always worked alone (indeed, Gregory's teaming up with Phelippes at Chartley had been a rare occurrence and was not repeated), this team of at least a dozen individuals worked in tandem and in the same room, much like a modern production line. Their task was to quickly open, copy, refold and reseal scores of letters before releasing them back into the postal stream, their recipients hopefully remaining ignorant of the violation their letters had undergone. Meanwhile, Postmistress Alexandrine sold the information she uncovered to the highest bidder.

One of the reasons that this more centralised mode of espionage operation developed on mainland Europe earlier than in England was the

demand for information caused by the Thirty Years' War. In England, the conclusion of peace with the Spanish in 1604 reduced the necessity for a fully fledged intelligence system gathering and storing information to use against its enemies (the Gunpowder Plot notwithstanding), and by the 1630s its secret services were largely reduced to a modus operandi of 'irregular opportunism'.[3] Few in the three kingdoms, even diplomats and ministers, expected their letters to be opened.

It is perhaps hard to comprehend, but if you were not an incarcerated deposed queen or a similarly indisposed suspect in the Gunpowder Plot, you would not necessarily consider that someone might actually dare intercept your letters. The sanctity of the mail was considered absolute – even the Jesuit Henry Garnett was surprised when he realised that not only had the letters between himself and Anne Vaux been intercepted and read, but that they had then been counterfeited so well that neither he nor Anne suspected foul play. In 1633, the Stuart agent in Brussels, Balthazar Gerbier, complained that someone within the Taxis postal service had 'kidnapped' his 'sacred' packets of letters and robbed them of their innocence: his horror would be all the more visceral when he realised that this violation had occured at the behest of a woman and that she had instituted a whole system purely to carry out such abuses systematically.[4] This negative reaction to postal violation was a recurring theme of the mid-seventeenth century, so much so that King Gustavus Adolphus of Sweden somewhat disingenuously gave the interception and publication of some of his letters to the prince of Transylvania as a reason for his joining the Thirty Years' War.[5] The Taxis postal system was subsequently dismantled in those areas of the empire the Swedes conquered (though the Swedes used the opportunity thus presented to begin intercepting the mail themselves, even that of their allies).[6] In England, a similar squeamishness was still present in 1642 when Lucius Cary, 2nd Viscount Falkland and Charles I's secretary of state, argued that the opening of private mail was 'a violation of the law of nature that no qualification by office could justify a single person in the trespass'.[7] Edward Sackville, 4th earl of Dorset and lord chamberlain, also found his thoughts regarding the practices of the king's enemies conjuring up images of sexual ravishment: 'In these licentious times, no rules of common honesty are obeyed, and shameful rapes made, even of letters,

between men and their wives, fathers and children, friends and friends. No traffic nor intercourse is safe, nor any man or woman secure whom malice, rage and fury subject to the unlimited actions of some too potent men, to do evil.'[8] The onset of civil war meant that nothing was sacred. Charles discovered this when his former Latin secretary and cryptanalyst, the German Georg Rudolf Weckherlin, was recruited by the Parliamentarians and subsequently opened, deciphered and published some of his former master's letters in the pamphlet *The King's Cabinet Opened* (1645). Even then it led to questions being asked in Parliament.

The Civil Wars changed the nature of counter-espionage. Parliament worked to overhaul the traditional system, in which individuals operating through patronage-based relationships acted as autonomous and sometimes self-appointed spy chiefs, not least as this often ended up with them struggling to exert their positions over each other as much as over the supposed enemy. It introduced a series of committees such as the Committee of Safety (later replaced by the Derby House Committee) and the Committee of Examinations to oversee matters of intelligence. The chairmen of these committees were authorised to open the letters of whomsoever they thought fit, and during this time men such as Thomas Scott and latterly John Thurloe would find themselves at the helm of an increasingly bureaucratic intelligence operation.[9]

In 1655, a mere six years after the execution of Charles I, the lord protector Oliver Cromwell took a leaf out of Postmistress Alexandrine's book and appointed his then head of intelligence John Thurloe as postmaster general. His reasoning became clear two years later, when he declared that, as letters were the primary mode through which spies might communicate secrets, they ought therefore to be thoroughly interrogated. By this measure, the founding of 'one general Post Office', he hoped to ensure that Thurloe and his successors might 'discover and prevent many dangerous, and wicked designs … the intelligence whereof cannot well be communicated, but by letter'.[10] By this one simple move, Cromwell established the Post Office as an organisation whose prime purpose was the surveillance of correspondence rather than its delivery.[11]

Thurloe's Post Office was a relatively organised system of eavesdropping, but one which added a bureaucratic slant to this classic

spycraft technique – instead of only sending spies to listen in on the conversations of suspects, it also sent their papery conversations to an office where they could be panned for the intelligence gold that lay hidden behind their wax seals, letterlocking, ciphers and other security mechanisms. This was eavesdropping from a distance.

Fig. 60: A 1650s portrait of John Thurloe, taking his gloves off.

Thurloe's unit was not the result of a dazzling moment of inspiration; he was simply following on from the work of his predecessors in gathering experts in all the techniques described in *Spycraft* under one roof in Whitehall, and he did so in the former chambers of Henrietta Maria, then simply known as 'the Queen's closet'.[12] The true change was in ambition – rather than cherry-picking correspondence or operating a sort of 'pop-up black chamber-lite' in the style of Somer at Tutbury, Phelippes at Chartley or Gregory in the Tower, the whole of the post was directed through Whitehall. In this way, Thurloe's operatives were placed where they could best be co-ordinated, controlled and exploited: in the middle of a stream of letters.

By concentrating a group of dark artificers in one place, Parliament had also taken a giant step towards the institution of a secret service no longer reliant on individual geniuses such as Arthur Gregory, but which operated

more like a machine. In Gregory's time there was no 'spy school'. Individuals would learn part of their trade through what were effectively intelligencing apprenticeships such as that which Francis Bacon undertook in the embassy of Sir Amias Paulet, or that which Thomas Phelippes's younger brother would later undertake in Bacon's household.[13] These arrangements were based around family contacts and patronage relationships, and were thus not easily accessible. If an intelligencer such as Gregory failed to take on an apprentice, their particular skills and techniques would likely die with them. By concentrating several skilled operatives in one room, the black chamber encouraged a steady cross-fertilisation of ideas and expertise, and ensured that the demise of one individual rarely meant that their particular specialism would suddenly be uncatered for. John Wallis, for instance, was a celebrated mathematician and Parliament's go-to cryptanalyst, whose skills were, if anything, even more rarified than those his predecessor Phelippes had acquired. But just as John Daniel learned the art of counterfeiting a hand by watching the writing master Bales at his work in his shop, so Scott was instructed in the art of cryptography by observing Wallis – one contemporary commented that Scott was soon able to 'unriddle any cipher that was ever made'.[14]

Thurloe's black chamber did not appear out of thin air, as Scott had already thought to employ multiple individuals alongside each other. Thurloe merely expanded and rationalised the chamber in line with his newly acquired powers as postmaster general. It was one thing to inherit some of a predecessor's network, but a fully functioning intelligence service needed the sense of continuity that could only come with documentation. Scott complained bitterly that he was not given any guidance regarding the operation of the secret services that had come before him. He could not get his hands on a single document. This was no new complaint: previous secretaries of state such as William Cecil and his son and successor Robert spent much of their lives trying to take control of the state's papertrails.

When Thurloe began his tenure as Cromwell's spy chief in 1653, he immediately seized every scrap of official documentation he could get his hands on.[15] When with the Restoration the government changed once more, Thurloe finished what he had started, and ran off with its archive, hiding it

in a false ceiling at his chambers at Lincoln's Inn. He had also kept a 'black book' full of names and used this to blackmail those of the new regime who wished to dispense with him. (Royalists such as Edward Hyde and Joseph Williamson tried to locate and neutralise this dark archive, but without success.)[16] Not all was lost, however, as Thurloe reckoned without a key feature of the black chamber: institutional memory. The chamber had become a process as much as a collection of spycraft specialists, and one of its members, Samuel Morland, had not only mastered several of its 'departments', but had been working as a double agent since 1659. He, along with the Dutchman Isaac Dorislaus, simply continued to be employed in the chamber as those around them disappeared in the usual frenzy of political bloodletting that accompanied a change of government. Thurloe may have appropriated the archives of the secret services, but Morland remained, in effect, the archive of its techniques.

In many ways, Morland was a man cut from the same cloth as Gregory. He had his fingers in many technological pies, even inventing an early version of the pocket calculator. In 1664 he gained the ear of the secretary of state Henry Bennet, soon to be Lord Arlington, and won an audience with the restored monarch Charles II to show him his 'models in little of several engines and utensils'. These were a series of devices designed to help replicate the counterfeiting skills Gregory and others had previously mastered. It was impossible to distinguish counterfeits made with Morland's 'engines and utensils' from the original letters, so the king ordered that his methods be put to work.[17]

IMPROVING THE BLACK CHAMBER

One technique that was vital to an efficient counter-espionage operation was the speedy production of accurate copies of the intercepted letters. This did not merely allow a letter to be sent on to its original destination without an overly suspicious delay, but was also of vital importance to effective codebreaking, and the more accurately transcribed letters a cryptanalyst had, the better. This was a truth long realised. Thomas Phelippes had once complained of the poor quality of the copies of ciphered letters he was

expected to work from – Robert Cecil was reluctant to give him originals, not least when his cryptanalyst was incarcerated at the Fleet in the mid-1590s. Elizabeth's secretary of state was asking the impossible, unless Phelippes was to rely on some manner of divine intervention: 'I hope her Highness will not expect I should do more than a man can do upon an ignorant body's transcript unless I were a Daniel that could tell the dream that was forgotten.' Phelippes felt his time was being wasted: he suspected the original letter was a forgery meant as misinformation. Having none of his own collection of papers to hand, and lacking access to the original, he could neither compare cipher systems nor handwriting to ascertain whether the Spanish had sent a fake cipher to deliberately send the English authorities down rabbit holes.[18] Morland said that he had developed a way to provide accurate copies of documents, allowing for both accurate decoding and also for several individuals to be able to consult them simultaneously. Gregory had asserted the same some seventy years before. Their respective solutions, though strikingly different, provide a glimpse of what was to come: an intelligence unit that functioned via a host of easily replicable actions rather than relying on the artistry of the true dark artificer.

Gregory's perspective box allowed even a relatively unskilled draughtsman to copy any letter quickly, even if it was written in invisible ink or cipher. The idea probably occured to him while he was assisting Phelippes at Chartley, confronted by page after page of cryptotext in need of copying. Even for a man with his command of a quill, reproducing hundreds of cipher symbols accurately was fiendishly difficult and time-consuming, and too many errors made breaking a cipher more challenging than necessary. His was a game-changing piece of technology, but its success was short-lived, as the secret to its construction (and, it appears, even of its existence) subsequently lay hidden for many years in the archives it may have helped to create.

Morland's method also took the creation of multiple exact copies of documents out of the hands of the specialist scrivener. Whereas Gregory's perspective box was a variation of the *camera lucida*, Morland's innovation seems to have been much more akin to that mainstay of the modern office, the photocopier. Its inventor claimed that with it he could not only copy documents 'in under a minute' – no scrivener could work at such speed –

but also revive ink that had faded.[19] Morland left no further clues as to how his machine might have worked. Others have surmised, however, that it was effectively an early incarnation of the copying machine patented by James Watt a century or so later, and that Morland may have developed it from an even earlier innovation by noted intellectual Samuel Hartlib.[20] According to the diarist and founding Fellow of the Royal Society, John Evelyn, Hartlib had 'an ink that would give a dozen copies, moist sheets of paper being pressed on it, and remain perfect; and a recipe how to take off any print without the least injury to the original'. (Hartlib also informed Evelyn that there were German stoves which could 'discharge excellent perfumes about the rooms', furnaces which secretaries and spy chiefs under Elizabeth I would no doubt have seen as all their nightmares come true.)[21]

Watt's device worked by pressing a thin piece of moistened paper onto the document to be reproduced, and thus transferring its image from the original to the copy paper – what is known as offset printing. The real work was done by the ink, however. Watt provided a recipe for the ink with which the documents to be copied ought to be written, and also a solution to moisten the copy paper. The two recipes are rather familiar; the former fundamentally gall-water–copperas ink, the latter simply gall-water. When pressed against the document, the gall-water in the 'copy paper' was activated by the copperas in the document ink. Watt's copying machine, and by inference Morland's, was in effect a very targeted invisible ink reveal.[22]

The copying machine was but one of a number of devices designed by Morland that would make the black chamber work more smoothly while demanding less expertise from its operatives. In 1666, he published a treatise entitled *A New Method of Cryptography*. Though short at a mere twelve pages, it included several hand-coloured copperplate engravings printed on a roller press installed in his cellar.[23] Morland stated that his *New Method* differed from other systems by being 'wonderfully facile and practicable', and that it took no more time than copying a letter by hand in a letterbook for administrative purposes as all statesmen were prone to do anyway. He also boasted of its great security, claiming that no cryptanalyst would be able to unravel the secret message 'through all the turnings, windings, and dark passages of so many cryptographical meanders', unless

they used ‘the Black Art’.[24] As ever, he appears to have been over-egging his pudding, and opinions of the usefulness of his treatise vary.[25]

Morland was ever mindful of those who had ‘oft times occasion to hide a word, or short sentence, and not a whole page or letter’, that is, the occasional cryptographer. To facilitate easy and quick encryption and decryption, therefore, he ‘thought it convenient … to publish the description and use of a small portable, and low-priz’d [cheap] Machina, very useful for that purpose’.[26] This little machine was an updated version of Alberti’s cipher wheel which used three wheels instead of two.[27] As well as describing it on paper, he also had a super-deluxe customised version of his cipher wheel made in silver for Charles II at the cost of £14 (cast from brass moulds he had made at the Royal Mint in the Tower, plain versions of his wheel in wooden boxes came in at a mere 10 shillings a piece). Developing these new devices cost £272 (around £30,000 today), but the king was more than appreciative of this sort of machinery (perhaps a taste inherited from his aunt, Elizabeth Stuart, who often gave watches as gifts and was fond of automata).[28] Like Gregory before him, Morland understood the power of demonstration; and how better to effect this than the rendering of a paper treatise into a tactile, user-friendly 3D working model? He even included a small aid to his wheel’s operation, a ‘digital index … which is to be put on the third finger of the right hand, that so he may not be constrayn’d to lay down his pen, at every motion’.[29] Morland was intimately acquainted with the process of enciphering and deciphering letters as it was part of his job, and this knowledge informed his devices. His machines were designed both to enhance performance and to save time.

Of the various devices Morland created for the black chamber, only the calculating machine appears to have survived, and this may well be due to the fact that most of his ‘engines’ had only seen the light of day in 1666, the year of the Great Fire of London. In 1689, Morland recounted how his copying machine was used ‘at the General Post Office until at the Fire of London the apparatus was destroyed and was not set up again’. Morland himself surmised that the chamber was not reconstructed due to the necessary money being syphoned off by corrupt officials.[30] There is no evidence of how successful Morland’s copying machine was, as only two examples of his process are extant, and of these only one (which bears on

its reverse the words ‘Sir S. Morland’s proposal copied in a minute’) is accompanied by what appears to be the original. The copied text is fainter than the apparent original and appears as if it was copied by mirror writing, as one would expect from a technique which relies on taking a direct impression.[31] On flipping the image, however, it is plain that copy and document, while containing the same words, are subtly different.[32]

Morland was a great believer in the importance of surveillance and of the part the Post Office could play in this, writing that

> a skilful prince ought to make watchtowers of his General Post Offices of all his kingdoms, & there to place such careful sentinels, as that by their care & diligence he may have a constant view of all that passes of any moment throughout the universe but more especially a true account of the various tempers of his own subjects, & of the first ferments of all factions, without which it is morally impossible for him long to sit safe on his throne …[33]

It was for this reason that he made his proposals for ‘the King’s Secrett Service’, which he sent to Major John Wildman, the new postmaster general, at some point between 1689 and 1691. In it Morland listed its desiderata, which included the following:

> To counterfeit all hand writing so dextrously that upon occasion of State the King may send the copies and keep the originals of any letters, dispatches or other papers, till any designs be ripe for conviction.
>
> To copy any number of whole sheets of paper close written on both sides in as many minutes time, with the advantage that it will be impossible for the copies to be erroneous.[34]

Morland was trying to rekindle interest in his copying machine, and thus his vision of a black chamber as an egalitarian surveillance system fuelled less by personal expertise than by easily replicable actions aided by cunning machines. For a short period Wildman acquiesced, and Morland set about hiring some sixty workmen to rebuild his machines at Lombard Street.[35] Feeling hard done by as a result of an unpaid pension, Morland suggested

that the new king, William III, employ him on the upcoming waterworks at Hampton Court as ‘a fair pretense to cover the secrecy of intelligence’, under which he might continue to work on his spycraft machines.[36] It seems likely that this final proposal was not taken up: when in 1695 secretary of state Charles Talbot, 1st duke of Shrewsbury demanded to know of Morland, now blind and ailing, ‘where those instruments and utensils’ he had once shown to Wildman ‘were disposed’, Morland refused to answer and appears subsequently to have hidden them.[37] The new regime, for all the pretensions to modernity it professed, with institutions such as the Royal Society laying claim to a new vision of progress based on co-operation and merit rather than the individualism of the past, had begun to lapse back into the same corrupt systems of patronage that had once persuaded Gregory to keep his spycraft secrets to himself.

UNLOCKING THE SECRETS OF SPYCRAFT

Espionage is a messy and unpredictable business, and spies are slippery and elusive characters, but it is by concentrating on its physical manifestations that we can uncover not only the constant battles being fought between spies and counterspies but also highlight the all-too-often invisible actors in the best-known stories, the dark artificers such as Arthur Gregory. It might appear as though Gregory, for all Camden’s praise of his ability to reclose packages imperceptibly, left little in the way of a technical legacy hidden amongst his letters other than a tendency towards self-aggrandisement: ‘I have in myself to do Her Majesty especial service in such sort as all our engineers never dreamed of.’ He also presented a ‘portable counting house fit for all chambers’, to Robert Cecil as a gift. It may well have been a boon to the cryptanalyst making use of frequency analysis, as access to a calculator of sorts would have sped up decoding.[38] We will never know, as neither he nor Cecil described the machine or its workings in greater detail, and, unlike Morland’s calculator, there is no surviving example. For all Gregory’s innovative genius, he, like Morland, made no long-term contribution to the English secret services, because he kept his techniques to himself. By piecing together his epistolary remains, however, we can still

deduce that Gregory counted amongst his many innovations a method of rapidly counterfeiting seals, making it a viable option within such a time-sensitive operation as interfering with the post – if a letter took too long to arrive at its destination, suspicions would arise that it had been tampered with. Della Porta's isinglass method was good for 'lesser seals', or for those counterfeiters happy to wait three days for their gypsum to dry and then to send off a letter sealed with mere smudges and splodges; Gregory, instead, wanted a substance that could reproduce seals quickly, in 'large quantities', and with its features as sharp as a first impression. Gregory may have begun by deducing many of his techniques from 'books of secrets' such as della Porta's *Magiae Naturalis*, but he moved far beyond the shaky methods presented on the printed page to fashion techniques that survived exposure to the pressure-cooker environment of counter-espionage work. Gregory's experiments, of which we only have fragmentary reports, still epitomise the continuing quest to master the faithful reproduction at speed of all the authenticating devices then available (paper, quill, ink, folding, seals and handwriting), a search that continued to be necessary to professionalise the secret services.

In examining the physical remains and travails of spycraft techniques, we can not only reread some of the era's most crucial episodes, but can expose those all-too-invisible technicians whose actions and skills propelled them. By understanding the way in which cipher and codes were actually used in the field – as opposed to their presentation in textbooks – we can see that it was the royal consorts who introduced the technique into England. In relation to one of the more famous plots of the era, we can see how the undoing of Mary, Queen of Scots was not by the hand of Babington but by those of Claude Nau, Gilbert Curle and Jerome Pasquier. Not only did these secretaries play a crucial role in exposing a woman who fully understood the nature and ramifications of communicating by cipher, but they also allow us to see that the so-called 'Gallows Letter' has been misunderstood for hundreds of years. The doodle of the gallows was never on a single letter, but on a packet, and in any case did not refer to Mary's fate, but to that of her secretaries. Phelippes called another letter, the one which truly was the undoing of Mary, 'the Bloody Letter'. Phelippes knew full well a condemned queen would not swing from the gallows, but he hoped that his true opponents, the secretaries, would do so. The real battle

in this plot was not between Walsingham and Mary, nor even Walsingham and Babington, but between Phelippes and Mary's secretaries, actors who remain peripheral characters in nearly all of the queen's biographies. The Babington Plot was not defeated by cryptanalysis, but by Walsingham's cunning shifting of the field of conflict. By employing Gifford to syphon off Mary's correspondence while allowing her to believe that it was going on to its destination unhindered, and in the process intercepting several cipher keys, Walsingham gained crucial hours if not days in which to fully frustrate Mary and her secretariat.

The increase in surveillance over the course of the seventeenth century was accompanied by a growing understanding of the need to disguise one's intentions, or even one's identity. Use of steganographical techniques such as mercantile discourse increased, as did attempts to hide identities through counterfeiting hands. The use of steganography is difficult to spot in early modern letters, as its primary security feature was not complexity, which usually advertised itself through use of mystifying symbols or numerous folds, but invisibility. By fully understanding how techniques such as the Cardan grille might actually have worked in the field we can, for example, not only show that a woman, Lady Brilliana Harley, was an important exponent of the art (and thus far its only identified practitioner), but show how other letters might betray the use of such a grille. This will allow us to discover other users in the future.

The ultimate steganographical technique was the use of invisible inks. As with all spycraft techniques, invisible inks were more difficult to use effectively than is generally appreciated, and also came in more varieties than generally accepted. Each white ink had its pros and cons, and presented particular challenges to the counterspy. By exploring a famous incident which revolved around invisible inks, we not only spot the use of unusual substances such as marmalade, but again see the actions of usually invisible agents. When imprisoned in the Tower following the Gunpowder Plot, Henry Garnett and Anne Vaux were hoodwinked by the genius of Arthur Gregory and the Tower's then lieutenant, Sir William Waad. Waad's man Carey intercepted their letters, and Gregory revealed the messages they had hidden with their particular choice of inks. This, naturally, rendered the original letters unusable for anything but evidence. Using his perspective box and no little skill, Gregory counterfeited their letters – invisible ink and

all – so that these incriminating communications might continue until enough evidence was gathered. This leads us to the conclusion that neither Garnett nor Vaux read the letters that they sent each other. Instead, they read the letters forged by Gregory. The letters in the archives were those intercepted, opened and read by the authorities – we do not, and never will, know what was received by either Garnett or Vaux. The letters in the archive available to the researcher do not so much illuminate the events, as they illuminate the workings of the surveillance system.

And finally, the weapons used to effect the last resort of the spy, assassination, reflect the conclusions reached about letters – an assassin was at their most vulnerable immediately after carrying out their mission. Weapons such as stilettos and handguns had their advantages, but both had to be used from relatively close range – in the case of the stiletto, intimately so. Poison was the spy's true weapon – it was not just the last resort of wronged women. As insubstantial as it was terrifying, poison displaced the assassin into a different space and time from their victim, and could be administered without the blind courage or training demanded by the use of stiletto or pistol. A truly egalitarian weapon, poison could be used in such a way that at the moment of truth, the assassin would be long gone. This quality, along with the lack of medical consensus over the use, cure or even nature of poisons, meant that poison was a weapon that perfectly fitted the spy's aim of asserting political action through manipulation of information – there was often no need to poison anyone, as fear of poison was enough to get the job done. Our exploration of its use has brought clearly into focus the horror of the regime whose rival spy chiefs framed naïve conspirators such as Edward Squier – and innocent physicians such as Roderigo Lopez – simply to further their own careers.

Ultimately, *Spycraft* shows us that the true fingerprints these spies left behind are in the techniques they used to carry out their missions, techniques that were developed by the Gregorys and Morlands of the era. It is in the archives that we may catch these spies and dark artificers, and through the physical remains of their interventions that we can best understand their nature. When it comes to those invisible actors in the dangerous trade, we truly may 'know them by their foldings'.

LESSONS: THE SCHOOL OF SPYCRAFT

The following section concerns the practical application of some of the techniques discussed in *Spycraft*. These lessons may be experiments carried out by ourselves and others, step-by-step explanations of how certain ciphers functioned, or simple tables containing lists of ingredients and their modern equivalents. It is worth pointing out that if there is one thing that we have learned about spycraft techniques in general, it is that they do not always work as advertised: they often need some coaxing to achieve the best results.

The information in this book is provided for entertainment and historical purposes only – responsibility for its use resides with the reader and the reader alone. Neither the authors nor the publisher accept any legal responsibility or liability for any use of the substances listed in *Spycraft*, and we do not endorse the use of any ingredients that are toxic or otherwise harmful to beast or human (whether in liquid, powder, plant or amphibious form) by the reader.

1. FRAUD & FORGERY

Lesson 1.1. Counterfeiting Seals: A Gypsum-Based Method[1]

Ingredients

Anhydrous gypsum powder
Water
Gum arabic
Olive oil
Shellac solution
Glycerine

Process

— Apply olive oil to wax seal
— Mix 2 parts water to 1 part anhydrous gypsum powder and apply mixture to cover as much of wax seal as possible
— Allow to dry for at least 1 hour
— Apply 1 part water to 1 part anhydrous gypsum powder mix to completely cover the wax seal
— Let dry for approximately 1 hour
— Mix 1 part water to 1 part anhydrous gypsum powder (with 5 per cent gum arabic) and use this mixture to apply strengthening material (such as fabric) to the reverse of the gypsum cast
— Allow to dry for between 2 hours and 2 days
— Carefully release gypsum cast seal
— Cover gypsum cast with shellac
— Let dry for at least 5 minutes
— Screw gypsum cast into screw stamper (see Fig. 9)
— Cover gypsum cast with 1 part glycerine to 1 part olive oil mixture
— Apply hot wax to letter
— Apply gypsum cast to wax
— Allow wax to cool
— Remove cast
— Retouch wax seal as necessary

Notes

Extreme care is necessary here; there are several points at which things can go wrong:

1. if oil gets on the paper around the seal it may alert the recipient that subterfuge has taken place
2. as the first water–anhydrous gypsum powder mix is quite watery, it is liable to drip onto the paper, again potentially alerting the recipient
3. failure to add enough strengthening material can lead to the cast breaking, while having too much (especially if it takes the form of a piece of fabric) makes it liable to leaving traces on the final seal
4. the seal cast may well break when being removed from the seal
5. adding support to the cast in the form of a screw stamper and/or a plate to support the whole reduces breakage
6. the cast must be sealed with shellac and oiled to prevent gypsum residue remaining in the final seal.

Conclusions

This process is far more complicated and delicate than della Porta and company make out. It also takes quite an investment in time: to make a good counterfeit could take anywhere from two days to a week. An experienced and skilled operator can, however, make seals that are indistinguishable from the original, and, as Gregory suggests, it is important that the seal to be cast from is as good an impression as possible.

Lesson 1.2. Counterfeiting Seals: Other Recipes

While the gypsum recipe is perfectly safe, the other recipes mentioned by della Porta are not so, as they use ingredients that are toxic. Here are the basic processes that are at work:

Sulphur + Ceruse

This recipe from della Porta combines sulphur and ceruse (lead carbonate and lead hydroxide) to create a soft cast of a wax seal. Depending on the sulphur used – potentially sodium sulphide, sodium sulphate or atomic sulphur – the resulting cast compound might be lead(II) sulphide, known as galena, or lead(II) sulphate, known as milk white (see della Porta, *Natural Magick*, 351).

Vinegar + Vitriol + Verdigris + Iron + Quicksilver

This recipe from della Porta is more complicated in its method and materials. The combination of vinegar and vitriol, or acetic acid and sulphuric acid, with verdigris, either copper(II) carbonate or copper(II) acetate, creates a corrosive environment for the iron plates. With the addition of quicksilver, or mercury, a casting compound is created, potentially mercury(II) sulphate, mercury(II) acetate, mercury sulphide (known as cinnabar), or some combination thereof (see della Porta, *Natural Magick*, 351).

Steel + Quicksilver

This recipe from della Porta combines steel and quicksilver to create a metal cast of a wax seal (see della Porta, *Natural Magick*, 351).

2. CIPHERS & CODES

Lesson 2.1. Homophonic Ciphers

If we take a simple substitution alphabet like so:

a	b	c	d	e	f	g	h	j	k	l	m	n	o	p	q	r	s	t	u	w	x	y	z
u	w	x	y	z	a	b	c	d	e	f	g	h	j	k	l	m	n	o	p	q	r	s	t

and use it to encode the phrase ‘cloak and dagger’, we end up with ‘x f j u e u h y y u b b z m’.

A homophonic cipher is simply a cipher that provides more than one possibility for some letters of the alphabet. If, therefore, we add a single homophone for just three of the more common letters (namely ‘a’, ‘e’ and ‘o’), like so:

a	b	c	d	**e**	f	g	h	j	k	l	m	n	**o**	p	q	r	s	t	u	w	x	y	z
u	w	x	y	**z**	a	b	c	d	e	f	g	h	**j**	k	l	m	n	o	p	q	r	s	t
η				δ									γ										

‘cloak and dagger’ can now be encoded in thirty-two different ways, including, for instance, ‘x f j u e η h y y u b b z m’, ‘x f γ u e η h y y u b b z m’ and ‘x f γ u e η h y y u b b δ m’.

If we add another homophone for these three letters, so that a = u, η or ρ; e = z, δ; or π; o = j, γ or σ, the number of permutations shoots up to 243. With three or more possible homophones for common letters such as ‘a’, ‘e’, ‘i’, ‘o’, ‘s’, ‘t’, etc., things stand a fairly good chance of getting severely out of hand!

Lesson 2.2. Mnemonic Cipher Keys

Argenti’s mnemonic key used a keyword to reorder the alphabet, which was then represented numerically. After the keyword gives the substitutions for the first few letters (here we use ‘spycraft’), giving us the first eight letters of our substitution alphabet, the remaining letters are listed in order, giving us a complete alphabet as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
s	p	y	c	r	a	f	t	b	d	e	g	h	i	k	l	m	n	o	q	u	w	x	z

The above, converted into a usable encoding table, gives us:

a	b	c	d	e	f	g	h	j	k	l	m	n	o	p	q	r	s	t	u	w	x	y	z
6	9	4	10	11	7	12	13	14	15	16	17	18	19	2	20	5	1	8	21	22	23	3	24

Encoding ‘cloak and dagger’ thus gives us either ‘4161961561810106121211 5’ or ‘4.16.19.6.15.6.18.10.10.6.12.12.11.5’.

Lesson 2.3. Mnemonic Code-Name Keywords

BL, Egerton MS 2550 contains three cipher keys in which the spy’s code name also serves as a mnemonic code-name keyword, providing each individual with a personal, non-contiguous substitution alphabet.[2] The code names are Profligantes, Lycanthropus and Labyrinthus. To turn a code name into a complete substitution alphabet, write the unused letters of the alphabet in order underneath the code name, like so:

p	r	o	f	l	**i**	g	a	n	t	e	s
b	c	d	h	k	**m**	q	v	w	x	y	z

The matching letters are now taken as plaintext to cipher, such that plaintext ‘p’ is enciphered as ‘b’ (‘b’ is the first letter of the alphabet that does not appear in ‘profligantes’), while plaintext ‘i’ is enciphered as ‘m’. A full, unalphabetised table of this substitution alphabet would look like this:

p	r	o	f	l	i	g	a	n	t	e	s	b	c	d	h	k	m	q	v	w	x	y	z
b	c	d	h	k	m	q	v	w	x	y	z	p	r	o	f	l	i	g	a	n	t	e	s

An alphabetised table of this substitution alphabet would look like this:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	v	w	x	y	z
v	p	r	o	y	h	q	f	m	l	k	i	w	d	b	g	c	z	x	a	n	t	e	s

The phrase ‘cloak and dagger’ would thus encode as ‘rkdvlvwoovqqyc’.

The same process produces different substitution alphabets for the spies Lycanthropus and Labyrinthus:

l	y	c	a	n	t	h	r	o	p	u	s
b	d	e	f	g	i	k	m	q	w	x	z

l	a	b	y	r	i	n	t	h	u	s	c
d	e	f	g	k	m	o	p	q	w	x	z

This type of mnemonic cipher key also appears in the folium holding the so-called ‘Babington cipher’ along with those for Dr Lewes and Lady Ferniehirst (see Fig. 23) in the phrase ‘The watch words [are] diligently or faithfully’. These two words, ‘diligently’ and ‘faithfully’, function perfectly as mnemonic keywords in their own right:

d	i	l	g	e	n	t	y	a	b	c	f
h	k	m	o	p	q	r	s	v	w	x	z

f	a	i	t	h	v	l	y	b	c	d	e
g	k	m	n	o	p	q	r	s	w	x	z

Alternatively, they can be used together to form a single mnemonic keyword, ‘diligentlyfaithfully’ (one simply leaves out the ‘or’):

d	i	l	g	e	n	t	y	f	a	h	u
b	c	k	m	o	p	q	r	s	w	x	z

Lesson 2.4. The ‘Great Cipher’

This innovation was formalised by the great French cryptographer Antoine Rossignol, and was used in the mid-1600s. Rossignol had noticed that most nomenclators were built up in a logical (and thus predictable) manner. A list of names, for example, would most likely follow a strict hierarchy of importance, whereas words were extremely likely to be listed

alphabetically. Rossignol sought to remove these parallel relationships between plaintext and (numerical) code to increase the security of his ciphers.

For example, if one wrote, as most did, one's list of names in order of importance, one might end up with 1 = King James, 2 = Queen Anna, 3 = Prince Charles, 4 = Princess Elizabeth, 5 = Lord Buckingham, and so forth. Having ascertained that 1 = King James, one could easily deduce that 2 might be Queen Anna. In similar fashion, numerals replacing words or word-partials would invariably be listed alphabetically, such as 88 = when, 89 = where, 90 = which, 91 = who, 92 = why.

These internal relationships gave the cryptanalyst an extra way to recover the plaintext. Rossignol's idea was to mix the relationships up. The nomenclator above (1 = King James, 2 = Queen Anna, 3 = Prince Charles, 4 = Princess Elizabeth, 5 = Lord Buckingham, 88 = when, 89 = where, 90 = which, 91 = who, 92 = why) would be reorganised (e.g. 1 = which, 2 = Lord Buckingham, 3 = why, 4 = Queen Anna, 5 = who, 88 = when, 89 = Princess Elizabeth, 90 = King James, 91 = where, 92 = Prince Charles). Removing the parallel relationship between plaintext and code also made the life of both sender and receiver far more difficult, so the nomenclator would be written in two forms: the first was the encoding table, in which the plaintext was organised in standard (ie, hierarchical/alphabetical fashion); the second was the decoding table, which arranged the code in logical fashion.

Encoding Table		**Decoding Table**	
King James	90	1	which
Queen Anna	4	2	Lord Buckingham
Prince Charles	92	3	why
Princess Elizabeth	89	4	Queen Anna
Lord Buckingham	2	5	who
…		…	
when	88	88	when
where	91	89	Princess Elizabeth
which	1	90	King James
who	5	91	where

why 3 92 Prince Charles

See also the nomenclators employed by Elizabeth Stuart in her communications with Sir Thomas Roe in the late 1630s, which are expressed in varying degrees of logic, alphabetical or hierarchical (e.g. 1 = do, 2 = can, 3 = be, 4 = could … 45 = at, 48 = never, 51 = her … 116 = Sir William Boswell, 118 = [null], but 160 = England, 161 = His Majesty, 162 = the King, 163 = Scotland … 233 = agreement, 234 = agent, 235 = ambassador … 246 = aid, 247 = affairs, and so on).[3]

Lesson 2.5. Alberti's Cipher Wheels

To construct your own cipher wheel, simply visit https://yalebooks.co.uk/book/9780300267549/spycraft/ and print out one of the two outer volvelles (either 1. with the numerals for superencryption or 2. with a twenty-four-character early modern alphabet), and an index wheel (3. Alberti's original, 4. early modern English, or 5. uninscribed – make your own cipher!). Attach the index wheel to the outer wheel and cipher to your heart's content.

To give an example using Alberti's cipher wheel (Fig. 17), 'we are undone', the message we enciphered on p. 69 in the alphabet indicated by the wheel's configuration, becomes 'jv qfv jbtcbv'. The encryption is obviously compromised by the lack of a 'w' in Alberti's outer alphabet, but the message is enciphered using a single substitution alphabet (a monoalphabetic cipher), and is thus relatively simple to break – that is, 'v' is the most common letter, so probably equates to 'e' (as is, indeed, the case). Moving the cipher wheel one character for each of the message's letters, however, and we have a polyalphabetic cipher, and the message becomes rather harder to conquer: 'js ncp dvmtl'.

Lesson 2.6. Superencryption: Building Alberti's Numerical Nomenclator

The four numbers included on Alberti's cipher wheel (Fig. 17) were designed to be used with a numerical nomenclator. They can be arranged in many different combinations, from 1 to 4444, like so:[4]

Using one number gives us four options: 1, 2, 3 and 4.
Using two numbers gives us another 16 options: 11, 12, 13, 14, 21, 22, 23, 24, 31, 32, 33, 34, 41, 42, 43 and 44.
Using three numbers gives us a further 64 options: 111, 112, 113, 114, 121, 122, 123, 124, 131, 132, 133, 134, 141, 142, 143, 144, 211, 212, 213, 214 . . . up to 441, 442, 443, 444.
And using four numbers gives us a whole heap more: 1111, 1112, 1113, 1114, all the way to 4441, 4442, 4443 and 4444.
In total, there are 340 possibilities.

Each number combination would be assigned to a person, country, activity, thing, etc. These numbers could then be combined with the substitution alphabet when writing the cryptotext. In Alberti's clever system, the nomenclator numbers were also converted into the appropriate substitution alphabet, thus providing a second level of encoding, also known as superencipherment or superencryption. Nomenclators were usually committed to paper, as in Fig. 25, but a short enough nomenclator could be committed to memory instead, adding another level of security. Take this example:

1 = The King	11 = London
2 = The Queen	12 = Paris
3 = The Prince	13 = Antwerp
4 = The Pope	14 = Madrid

To encipher the message 'The King and Prince must leave London for Antwerp', we first use the nomenclator, giving us the following semi-ciphertext: '1and3mustleave11for13'. If we then encipher the message monoalphabetically using Alberti's wheel (index set at 'M'), we are left with 'mqftoajgh&vmjvmmxcfmo'. Any cryptanalyst applying frequency analysis to this message would doubtless conclude that the ciphertext letter

‘m’, being the most frequent letter in the message, represented the plaintext letter ‘e’, leading them down a fruitless and time-consuming rabbit hole. Other ways of helping disguise the existence of a nomenclator within a standard cipher alphabet included representing it with a letter prefix, giving you ‘ka’, ‘kb’, ‘kc’ to ‘la’, ‘lb’, ‘lc’, etc., as necessary.[5] In general, however, nomenclators would most often use straightforward numbers.

Lesson 2.7. Numerical Polyalphabetic Cipher Indicator

Another way of indicating a polyalphabetic shift cipher was using a numerical indicator at the beginning of the message. The numerals accord to the degree of shift, with 1 meaning a = a, 2 meaning a = b, etc. The number 436, for example, would mean using the alphabets D, C and F from the shift table in Fig. 19 (horizontal blue), repeating the sequence until your ciphertext is complete:

key/index	4	3	6	4	3	6	4	3	6	4	3	6	4	3	6	4	3	6	4	3	6	4	3	6
plaintext	w	r	i	t	e	y	o	u	r	m	e	s	s	a	g	e	l	i	k	e	t	h	i	s
cryptotext	a	u	o	x	h	e	s	x	x	q	h	y	w	d	m	i	o	o	o	h	z	l	l	y

So the plaintext ‘write your message like this’ will encode as ‘[436]auoxhesxxqhywdmiooohzlly’.

Lesson 2.8. The Keyword Cipher

The keyword could be agreed in advance or included in the ciphertext itself (though the latter makes it rather susceptible to breaking by a canny cryptanalyst). Here we encode a message using the keyword ‘SPYCRAFT’ that begins with the words ‘destroy the fathers’ using shift ciphers as indicated in the keyword. This can be achieved using a Trithemius table or an Alberti wheel:

key/index	S	P	Y	C	R	A	F	T	S	P	Y	C	R	A	F	T	S
plaintext	d	e	s	t	r	o	y	t	h	e	f	a	t	h	e	r	s
cryptotext	w	s	q	w	i	o	d	n	a	t	d	c	l	h	k	l	l

Your message will read ‘wsqwiodnatdclhkll’.

BL, Egerton MS 2550 shows one spy practising (albeit not always successfully) encoding and decoding two phrases – ‘God save King Charles’ and ‘this is midsommer’ – with the keyword ‘robertus’, using this exact tabular form.

Lesson 2.9. The Autokey Cipher

The weakness of the keyword is especially apparent when shorter keywords are used. Encoding the message from *Lesson 2.8* with the keyword INTER, for example, gives us a ciphertext of ‘mrmyfal nmw oanmwaf’. The fact that the TER of the keyword coincides with ‘the’ in this message twice, even in this short extract, is obvious from the (here underlined) repetitions in the ciphertext: ‘mrmyfal nmw oanmwaf’.[6] The autokey cipher fixes this weakness by removing the repetition of the keyword: in an autokey cipher, the keyword is used only once, with its job of dictating the shift alphabet in use then taken up *by the message itself*. The key for our message now becomes ‘spycraft destroy the fathers’:

autokey/index	S	P	Y	C	R	A	F	T	D	E	S	T	R	O	Y	T	H
plaintext	d	e	s	t	r	o	y	t	h	e	f	a	t	h	e	r	s
cryptotext	w	s	q	w	i	o	d	n	l	i	y	t	l	w	b	l	a

Your message will now read ‘wsqwiodnliytlwbla’. The underlined letters in the cryptotext of this autokey example are the same as in the keyword example in *Lesson 2.8*; after this the two cryptotexts diverge markedly.

Lesson 2.10. The Message Decoded (Fig. 22)

Beware that none of your messingers quhome you send forth of the Realm carie anie letters vppon themselves but make ther dispatches bee conveied either after or before them by some other Take heed of spies and false brethren that are amongst you spetially of some priestes alreadie practised by our enemies for your discoverie and in anie wise keepe never anie paper about you that in anie fort maie doe harme for from like errors haue come the only condemnation of all such as haue suffred heretofore againnst whome could there otherwise haue been nothing proved.[7]

4. INKS & INVISIBILITY

Lesson 4.1. Invisible Ink Forms from della Porta's Natural Magick, *340–3*

Recipe	**Reveal**
Vitriol dissolved in boiling water	Gall
Burnt straw in vinegar	Unclear
Sour galls in white wine	Unclear
Gall-water	Diluted vitriol
Solution of alum (for linen/rag)	Water
Lemon juice	Litharge in water and vinegar
Goat's fat on stone	Vinegar
Citron, oranges, onion, almost any sharp thing	Heat
Sour grapes	Heat (reveal as black)

Services	Heat
Cherry juice added to calamus	Heat (reveal as red)
Sal ammoniac solution	Heat (reveal as black)
Vinegar, egg white and quicksilver	Heat (reveal as white)
Ceruse and traganth gum	Candlelight
Vinegar or urine on skin	Soot or burnt paper
Fat, gum, fig-tree sap, milk of Tithymals	Coal dust
Gum arabic or traganth in water, write on glass	Soot or burnt paper
Smear goat fat and turpentine on paper, write with iron stilo	Soot only (not fire or water)
Beat an egg, write with liquid, blacken the paper	Scrape off the black, letters will appear white
Writing on an egg (3 techniques):	
1. Wrap eggshell in wax, scrape letters with iron stilo, soak egg in ‘waters of depart’ (nitric acid), remove wax	Crack egg and hold the shell to the light
2. As above but boil egg first; after writing in wax soak egg in a mix of alum and powdered gall, then in sharp vinegar	Remove shell, message will appear on the white of the egg
3. Mix alum and galls with vinegar, use this to write on the egg. Dry egg in the sun, place in ‘sharp pickle’	Reveal as above (This is Africanus’s method. Della Porta was unsure of what was meant by ‘sharp pickle’ but ‘put it into vinegar, and could do nothing of it’)

Lesson 4.2. Ingredients for Inks, Invisible or Otherwise

Name	**Modern Equivalent**	**Description**
Alum	Potassium aluminium sulphate $(KAl)SO_4)_2)$	White powder, used in pickling foods and as a mordant (fixer) for dyes
Calamus	Calamus	Cane plant aka sweet calamus/Sweet-scented lemongrass of calamus
Cervices	Services	Fruit of the service or sorb tree
Chalchantum		Synonym for vitriol
Cinnabaris (aka dragon's blood)	Cinnabar/Mercury sulphide (HgS)	Toxic ore used in alternative medicine, originally used as a pigment due to its deep red colour
Dragon's blood	N/A	'Bright red gum or resin, an exudation upon the fruit of a palm, *Calamus draco*' (*OED*, 'dragon's blood', n.)
Gum	Gum	'Viscid secretion issuing from certain trees and shrubs, which hardens in drying but is usually soluble in

		cold or hot water, in this respect [often] differing from resin' (*OED*, 'gum', n.2)
Gum, arabic	Gum arabic	Gum made from the hardened sap of the acacia tree, used as a stabiliser and emulsifier in foodstuffs and a binder for pigments
Gum, juniper	Sandarac	Gum made from resin of the cypress pine (*Callitris quadrivalvis* /*Tetraclinus articulata*)
Gum, traganth/Gum-dragon	Tragacanth	Water-soluble gum made from milkvetch or mallow, shrubs of genus *Astragalus* or *Sterculia*
Litharge	Lead(II) oxide (PbO)	Toxic reddish powder used in gilding – when mixed with linseed oil it makes a hard, waterproof cement
Quicksilver	Mercury	Highly toxic and reactive metal, liquid at room temperature
Sal ammoniac/Ammoniac salt	Ammonium chloride (NH_4Cl)	Salts used in breadmaking
Tithymals/Tithymalus,	Sap of spurge	Spurge, from genus

milk of		*Euphorbia*, used as a purgative
Turpentine	Turpentine	Spirits made by processing resin from pine trees, used as a solvent for making paint and varnishes
Vitriol, blue (vitriol of Cyprus or Romish vitriol)	Copper sulphate ($CuSO_4$)	Toxic crystalline substance used as fungicide
Vitriol, green/copperas (vitriol powder)	Iron(II) sulphate ($FeSO_4$)	Crystalline substance used as a mordant (dye fixative) in the textile industry and to blacken leather in the tanning industry; can be distilled to make sulphuric acid
Vitriol, oil of	Sulphuric acid (H_2SO_4)	Highly corrosive acid
Vitriol, white	Zinc sulphate ($ZnSO_4$)	Crystalline substance used as a mordant and preservative for leather

Lesson 4.3. Testing Inks, Invisible or Otherwise

#	Invisible ink	Material	1st Action	1st Reveal	1st Reveal permanent?	2nd Reveal?	2nd Reveal permanent?
1a	Lemon	Paper	**ALLOW TO DRY**	Heat	Permanent	N/A	N/A
1b	Lemon	Paper		Water	Fades	Heat	Yes
2a	Orange	Paper		Heat	Permanent	N/A	N/A
2b	Marmalade	Paper		Heat	Permanent	N/A	N/A
3a	Alum	Paper		Water	Fades	Water	No
3b	Alum	Paper		Water	Fades	Heat	Yes
3c	Alum	Linen		Water	Fades	Water	No
3d	Alum	Linen		Water	Fades	Heat	Yes
3e	Alum	Paper		Coal dust	Tempera-mental	N/A	N/A
4a	Copperas	Paper		Gall	Permanent	N/A	N/A
4b	Blue vitriol	Paper		Gall	Permanent	N/A	N/A

Testing by Laura James and Jana Dambrogio at MIT with Nadine Akkerman.

Lesson 4.4. Video Resources

There are several explanatory videos online, produced by Nadine Akkerman and Jana Dambrogio of MIT, that may be of interest. They include how to fold the triangle lock, how to make a tiny spy letter, how to hide a message in an egg, demonstrations of invisible inks including gall-water and copperas, alum and artichoke juice, and even how Elizabeth Stuart may have gone about decoding a letter. Go to https://vimeo.com/channels/secretwritingtechs to watch.

5. STILETTOS & STORYTELLING

This section comes with a warning: the substances listed here are poisonous. Do not handle, consume or otherwise use them.

Lesson 5.1. Organic Poisons

16th-/17th-Century Name	**Modern Name**	**Connected to Whom in *Spycraft***	**Notes**
Wolfsbane / Monk's-hood or conitum	Aconite, *Aconitum napellus*; in Europe the name wolfsbane is usually reserved for its white-flowered relative *Aconitum lycoctonum*	Richardus; Wayland	Highly toxic blue-flowered herbaceous plant; active ingredient, aconitine, is a potent alkaloid toxin; can be absorbed through the skin
Hemlock, Seneca or conitum	Hemlock, *Conium maculatum*	Culpeper, *A Physical Directory*, 35, 48; Galen; Paré; Wayland	Causes dizziness, vertigo, sleepiness and death; primarily administered by mouth but the toxin coniine can also be absorbed through the skin; small amounts can be fatal within thirty minutes

Mandray	Mandrake	Culpeper, *A Physical Directory*, 13, 44; della Porta, *Natural Magick*, 9; Galen; Wayland	Root of Mandragora; hallucinogenic narcotic often associated with witchcraft and used in medicine
Carula	Passion flower, *Passiflora caerulea*	Wayland	Leaves and roots are toxic
Henbane	Stinking nightshade, *Hyoscyamus niger*	Culpeper, *A Physical Directory*, 41; Paré	Hallucinogenic and narcotic; leaves can be dried and then used in drink or burnt; boiling the leaves in oil creates henbane oil; often cited as the drug taken by witches to give them the sense of flying
Opium	Opium	Culpeper, *A Physical Directory*, 48; Galen; Paré	Derived from the opium poppy; narcotic and hallucinogenic
Toad	Bufotoxin	Paré; Wayland	Toxic substance secreted by many toads, including the common European toad, *Bufo bufo*; similar in effect to digitalis, which

			derives from the foxglove
Cantharides	Cantharides, Spanish fly	Coke; Culpeper, *A Physical Directory*, 28; Franklin	Derived from crushed blister beetles; cantharidin causes blistering and is highly toxic; sometimes unwisely used as an aphrodisiac
Powder of spiders	N/A	Coke; Franklin	N/A

Lesson 5.2. Chemical Poisons

16th-/17th-Century Name	**Modern Name**	**Connected to Whom in *Spycraft***	**Notes**
Ratsbane or white arsenic	Arsenic trioxide (As_2O_3)	Franklin; Paré; Wayland	Arsenic is a semi-metallic element which occurs naturally and as a by-product of the copper smelting industry
Orpiment	Arsenic trisulphide (As_2S_3)	Paré	Often used as a pigment for painting as it is a deep yellow colour
Roseacre or	Arsenic	Coke	Also known as

realgar	tetrasulphide (As_4S_4)		ruby sulphide; used as red pigment
Mercury water	N/A	Franklin	
Mercury sublimate	Mercury(II) chloride ($HgCl_2$)	Coke; Paré	White powder
Lapis causticus or lye	Caustic potash or potassium hydroxide (KOH)	Coke; Franklin	Highly corrosive alkali commonly used in the period to wash clothes and in the tanning process
Ceruse	White lead ($2PbCO_3.Pb(OH)_2$)	Paré	Sometimes used as a cosmetic
Litharge	Lead(II) oxide (PbO)	Paré	Used to make sealing wax red
Verdigris	Copper carbonate ($CuCO_3$)	Paré	Made by reaction of acetic acid (vinegar) on copper; used as a colouring agent
Aqua fontana	Contained arsenic, lead, boiled toad	female Italian poisoning ring	
Aqua fortis	Nitric acid (HNO_3)	Franklin	

Lesson 5.3. Physical Poisons

16th-/17th-Century	**Modern Name**	**Connected to Whom in**	**Notes**

Name		***Spycraft***	
Filings of iron	Iron filings	Paré	Injures the intestinal tract
Powder of glass	Powdered glass	Wayland	Injures the intestinal tract
Powder of diamonds	Diamond dust	Franklin	Injures the intestinal tract
Filings of brass	Brass filings	Paré	Injures the intestinal tract

Lesson 5.4. Poison in Culpeper's A Physical Directory

16th-/17th-Century Name	**Culpeper's Comments**	**Page no.**
White hellebore	*Ellebori, Veratri, albi. nigri*. Of Hellebore white and black. The root of white hellebore … kills rats, and mice being mixed with their meat: it is but a scurvy, churlish medicine being taken inwardly, and therefore better let alone than used.	9
Mandrake	*Mandragoræ*. Of Mandrakes, a root dangerous for its coldness, being cold in the fourth degree, the root is scarce, and dangerous for the vulgar to use therefore I leave it to those that have skill.	13
Hemlock	*Cicuta*. Hemlock, cold in the fourth degree, poisonous.	35
Henbane	*Hyoscyamus &c*. Henbane … the black or	41

	common Henbane and the yellow, [are cold] in the fourth [degree], they stupify the sense and therefore not to be taken inwardly.	
Mandrake	*Mandragora*. Mandrakes, fit for no vulgar use but only to be used in cooling ointments.	44
Nightshade	*Solanum*. Nightshade, very cold and dry, binding, it is somewhat dangerous taken inwardly.	53

Lesson 5.5. Prophylactics in Culpeper's A Physical Directory

Substance to Treat	**Culpeper's Recommended Antidote**	**Page no.**
Cantharides	*Atriplex, &c*. Orach, or Arrach … they help such as have taken cantharides.	28
Opium, Hemlock	*Origanum*. Organy, a kind of wild Marjoram, hot and dry in the third degree; helps the bitings of venomous beasts, such as have taken Opium Hemlock, or Poppy.	48
General	*Ruta*. Rue, or herb of grace: … This I am sure of, no herb resisteth poison more. And some think *Mithridates*, that renowned king of *Pontus*, fortified his body against poison with no other medicine.	51
	(See also della Porta, *Natural Magick*, 9: 'Much Rue being eaten, becometh	

	poison; but the juice of Hemlock expels it; so that one poison poisoneth another.')	
Pestilence, poison, bitings of venomous beasts	Therica Diatessaron: This is a gallant Electuary, like the Author … it resists the pestilence, and poisons, and helps the bitings of venomous beasts.	177
Poison, filthy medicine	Mithridate. *Damocrates*. It is good against poison, and such as have done themselves wrong by taking filthy medicines.	179–80
Poison, bitings of venomous beasts	Andromachus *his Treacle*. The virtues of it are, it resists poison and the biting of venomous beasts.	183