Post-Medieval Archaeology **40/1** (2006), 33–61

'Unfitt for any moderne service'? Arms and armour from James Fort

By BEVERLY A. STRAUBE

SUMMARY: Following a devastating Indian attack in 1622 that killed a quarter of the Virginia colonists, King James I bestowed a 'princely and free guift' of weaponry on the Virginia Company of London for the colony's use. The gift included calivers, pistols, jacks of plate, brigandines, shirts of mail, and other arms and armour that were deemed 'unfitt for any moderne service' in England. At first glance, this shipment of obsolete arms appears to substantiate the traditional historical view that the English colonists were too ill equipped in both materials and skills to settle Virginia successfully. Recent excavations at James Fort, Jamestown, the site of the colony's initial settlement and its seat of government, have unearthed a wealth of arms and armour that attests the character of early military life at Jamestown. The evidence suggests that the Virginia experience led to adaptation of traditional military practices and equipment, rendering the 'unfit' arms and armour effective and useful for the context.

INTRODUCTION

On the morning of 22 March 1622 the English settlements along the James River in Virginia were surprised by a co-ordinated Indian attack that left over 300 men, women and children dead. The attack, organized by the Pamunkey Indian chief Opechancanough, took advantage of the complacency that had developed in the colony during the eight years of peace following Pocahontas' marriage to John Rolfe. Accustomed to Indians visiting or living amongst them, many of the English were killed with their own tools and weapons before they were even aware of 'the blow that brought them to destruction'.[1] By using the tactic of surprise, Opechancanough achieved more than he could ever hope to accomplish by a war waged against the settlers with their firearms and fortifications.

This act of violence spread fear throughout the colony and exposed the vulnerability of the isolated settlements stretched along the James River. In a desperate attempt to send military equipment quickly to the colonists so they could 'take just revenge' and 'secure themselves against . . . any other forraigne Enimy',[2] the Virginia Company of London[3] petitioned the Crown for certain arms stored in the Tower of London. James I agreed to make a gift of the requested weapons, which were described as being 'not only old and much decayed but with their age growne also altogether unfitt and of no use for any moderne service'.[4]

In September 1622, a shipment of these arms including 1,000 bills, 700 calivers, 300 short pistols with fire locks, 300 harquebuses, 400 coats and shirts of mail, 100 brigandines, 40 jacks of plate, 2,000 iron skulls, 400 bows and 800 sheaves of arrows, was supplied to the colony. Half of the bills and 100 of the firearms were diverted to Bermuda at that colony's request. Bermuda also received all the gifted bows and arrows for safekeeping until Virginia had need of them and could ensure that they would not fall into Indian hands, thereby making the natives 'acquainted with the manner of fashioninge the Arrowe heads'.[5]

 DOI: 10.1179/174581306X160116

The supply of obsolete and disintegrating weaponry from England appears to substantiate the traditional view of the Virginia colony that gained momentum following the American Civil War — as a fiasco, poorly planned, ill-supplied, and mismanaged. Nineteenth-century historians investigating America's beginnings minimized the role of Jamestown, located in the economically and culturally depressed South, in favour of Plymouth, in the victorious North. Unlike the English colony in Plymouth, motivated by religious principles and settled by devout families making a 'new' England in a New World, the first permanent English settlement of Jamestown has been portrayed as an economic scheme hatched by a group of entrepreneurs, essentially to line their pockets with as little expenditure as possible. Jamestown is seen as a colony that nearly failed — or that did fail — because it was overpopulated with effete gentlemen who would rather 'bowl in the streets'[6] than search for food or repair their ruinous shelters. The colonists were represented as a bunch of dilettantes, unprepared for the hardships facing them in Virginia and clueless as to how to protect themselves.[7]

Since 1994, archaeological excavations of the fort first built by the colonists in 1607 have uncovered numerous elements of arms and armour. The finds from closely dated deposits indicate that from the beginning the Virginia colonists were supplied with the same type of military equipment that was described as outmoded in 1622. As the finds from English Civil War contexts illustrate, it is not unusual to find arms and armour in military use many years after they are considered out of date.[8] Usually this reflects a scarcity of arms and a lack of funding to acquire them at short notice, as was certainly the case with the Virginia colony in 1622, but was not entirely true in 1607. While funding was always an issue with the Virginia Company, it had months to supply the first group of colonists and years of experience provided by previous explorations of the New World to inform its decisions.

The manner of warfare the colonists faced, or thought they would face, in the New World certainly dictated the type of weaponry with which they were supplied. The commonly expressed view that the colonists were not physically or psychologically prepared for what they found in Virginia is over-simplistic and misleading.[9] The English had already made several attempts to establish colonies in the New World, beginning with Martin Frobisher in the 1570s and ending with the 'lost colonists' of Roanoke in 1583. Although these efforts failed, they helped to inform the planners of the Virginia venture. Moreover, the English had colonized successfully in Ireland, where they also faced a resistant native population that engaged in guerrilla warfare. By the time the English arrived in Virginia, they were equipped with arms and artillery both to defend their settlement against anticipated Spanish attacks (which never materialized), and from the sometimes hostile indigenous population. They retained European military methods that worked in Virginia, and abandoned or adapted those that did not.

The colonists observed that the fighting methods of the Virginia Indians were 'by Stratagems, trecheries, or surprisals'.[10] Combat between the two groups consisted of skirmishes at fairly short range, as the Indians' chief offensive weapons were wooden swords, and the bow and arrow, which were inaccurate at distances over 50m.[11] The English quickly adapted from modern battlefield tactics, which used massed soldiers in rank and file, to more unconventional warfare. This was a warfare that the colonists who were veterans of the Irish wars, such as the colony's first president Edward Maria Wingfield, would recognize. John Smith speaks of training the men to 'march, fight, and scirmish in the woods . . . [so that] wee were better able to fight with Powhatan's whole force in our order of battle amongst the Trees'.[12] So, although outmoded for the type of formal battles in vogue in Europe, it could be argued that the colonists' outdated equipment represented suitable arms and armour for the ambush-type 'old style' engagements the English encountered with the Indians.

At the time Jamestown was settled there was a shortage of arms in England. There had been no considerable military engagements since the war against Spain, which ended in 1603, and England was not prepared for a major armed battle. By the early 17th century, the 'knowledge of the art and practice of war' had greatly diminished in England, protected as it was from the conflicts that plagued Europe by the barrier of the Channel.[13] The government strictly controlled the military equipment in the country and the weapons stored either in city armouries or in the private households of the rural gentry.[14] It is possible that some of Jamestown's arms were being supplied from these private armouries; there is, however, no evidence indicating this.

Gentlemen comprised about one-third of the individuals arriving at Jamestown in the first few years; they were probably responsible for many of the arms, especially the non-military issue weaponry, recovered from the fort. Most of them were well versed in the art of war through military service with European armies. Many had been introduced to the new military reforms in the

FIG. 1
James Fort: buckler, diam. 123mm (photograph, Michael Lavin, APVA).

Netherlands, fighting on the side of the Dutch in their war of independence against Spain. Sir Thomas Gates, who was serving in the garrison at Oudewater in south Holland, even brought his entire company from the Netherlands when he took command in 1609 as the colony's first governor.[15] Many of these veterans probably came to Virginia with their personal arms, rather than having to rely on cheaper military-issue weapons provided by the Company.

The buckler

An example of a civilian weapon that probably belonged to one of the colony's gentlemen is a buckler found in the bulwark trench of James Fort dating to *c.* 1607–10 (Fig. 1). The incomplete iron boss is all that remains of the small hand-held shield.

Bucklers were usually round, about 11–14in (0.28–0.36m) in diameter, with leather or wood foundations reinforced with overlapping iron rings. At the centre was a hollow iron boss with a projecting spike. Grips behind the boss on the backside allowed it to be held in the hand and be wielded to parry blows from an opponent's sword. Used in England from the 13th to the 16th century, these small leather or wooden shields, primarily of Welsh manufacture, were very well suited to hand-to-hand combat.[16] Bucklers were carried in the hand opposite the sword to 'dint and blunt the edge of [the] Enemies Sword', and protect the wearer's body 'from Blows and Wounds'.[17]

In the mid-16th century, Italian fencing schools began championing the use of the long piercing blade of the rapier, in conjunction with a dagger in the other hand, to block thrusts. This 'poking fight of rapier and dagger'[18] gained widespread popularity among English swordsmen. The buckler provided little defence against the lengthy rapier and was soon abandoned.

The James Fort example is the only documented buckler excavated in English America. It was probably an old weapon when it was brought to Jamestown as the pear-shaped hollow boss reflects the form found on buckler types depicted in use *c.* 1520,[19] and the manufacture of bucklers is thought to have ended in the mid-16th century.[20]

Following the Indian massacre of 1622, the Virginia Company requested hundreds of old bucklers that they understood were in the royal armoury, only to be told that they were misinformed, 'there not being any such at all decayed in that Office'.[21] It is unclear from this whether there were no bucklers in storage or whether there were no 'decayed' bucklers; but since the buckler was considered an archaic weapon by the time of Jamestown's founding, it was probably the former.

Horseman's axe

Another weapon probably brought by one of the colony's gentlemen is a horseman's axe found in the cellar fill of Structure 165, dating to *c.* 1610 (Fig. 2). The small iron axe is offset by a thick and slightly curved fluke. Suggestive of the high quality of the arm are the traces of silver damascening on the hexagonal ferrule for the attachment of the (now missing) wooden handle.

Cavalry forces in England used this type of weapon[22] but there is no indication that cavalry was used in the colonists' military engagements. There were few horses in the early colony: the first eight arrived in August 1609. By October, only 'six Mares and a Horse' remained, and these became sustenance for the starving colonists over the following winter.[23]

FIG. 2
James Fort: horseman's axe, length 170mm (photograph, Michael Lavin, APVA).

Armour

While armour is rarely found on archaeological sites in England, many elements of body armour such as breastplates, tassets, backplates, gorgets and helmets have been discovered in Virginia's early 17th-century trash deposits. At the time that the use of armour was declining in England as it became less and less useful against increasingly powerful firearms and new battle tactics, it was needed in Virginia for protection against Indian arrows. This need continued until serious threats from the Indians abated in the mid-17th century.[24] Even so, the colonists found the body protection to be a disadvantage at times. John Smith noted that 'the Salvages are so light and swift, though we see them (being so loaded with armour) they have much advantage of us though they be cowards'.[25] The lack of dexterity, as well as discomfort in scorching Virginia summers, caused the early colonists to eschew the wearing of plate armour until the introduction of martial law in 1611. The result is that many elements of plate armour have been found in the fort's early trash deposits. Some pieces reflect recycling efforts, such as the breastplate that had been carefully fashioned into a cooking pot or pail and was found in the *c.* 1610 cellar of Structure 165 (Fig. 3).

Breastplates, protecting the chest area, were integral parts of armour worn by European soldiers from the 15th until the 17th century. Stylistically they reflect male civilian clothing, which provides a general date of manufacture. A breastplate excavated from the fort's bulwark trench is of a very rounded 16th-century type with a short bottom flange (Fig. 4). The armholes are cut wide to incorporate the addition of underarm gussets. Gussets, which were unfashionable by the beginning of the 17th century,[26] are curving iron lames that are riveted to the armhole opening of the breastplate. On some gussets the rivet slides on a horizontal slot in the upper end, allowing for some movement and flexibility. All but two of the 173 gussets found in the fort were excavated from *c.* 1610 contexts, which suggests that these elements had been removed from breastplates and discarded (Fig. 5).

Another complete breastplate was recently recovered within a fort-period well [Structure 170] that was filled in the 1620s (Fig. 6). It is of the 'peascod' shape more typical of the very early 17th

FIG. 3
James Fort: breastplate fashioned into a cooking pot or pail, *c.* 1610, length 300mm (photograph, Michael Lavin, APVA).

century and has brass diamond-shaped washers on the shoulder strap rivets, a feature possibly suggesting a Dutch origin.[27] Significantly, the breastplate was modified on the right armhole, which had been cut away to incorporate a small rectangular plate with rounded edges (Fig. 7). It is one of three breastplates excavated from early 17th-century Virginia sites that display this alteration.[28]

The breastplate adaptation dates from some time after Sir Thomas Dale's arrival in the colony in 1611. As the new governor, Dale enforced military discipline through his code of behaviour entitled the 'Lawes Divine, Morall and Martiall'. In an attempt to reduce the deaths of his men from Indian arrows, he made it a law that 'every shot shall either be furnished with a quilted coate of Canvas, a headpiece, and a sword, or else with a light Armour and Bases quilted'.[29] At the time it was not customary for soldiers carrying firearms to wear 'light armour' — that is a breastplate and backplate known together as a cuirass. Patterned after Dutch military reforms implemented around 1590, there were at this time three components to the English army: the pikemen, who carried a pike and wore armour; the musketeers, and shot (calivermen) who carried firearms but were armour-free (Fig. 8).

In light of the implementation of this new order for all to participate in the 'dayly wearing of these Armors', the modification to the breastplate provided the men with firearms a way to steady the butt of their weapons against the slippery surface of the breastplate. In other words, the added plate functioned as a stop on the right breast, which early English military manuals show as the proper place for the musket, rather than against the shoulder.[30] These laws must have worked, for one colonists remarked that the Indians 'not being acquainted nor accustomed to encounter with men in armor, much wondered thereat especially that they did not see any of our men fall as they had done in other conflicts'.[31]

With the greater use of firearms on the European battlefields in the 17th century and the concomitant need for thicker, heavier and more cumbersome armour, there was a gradual decline in the use of armour. Among the first elements to be abandoned were tassets (except for fighting on foot)[32] and, judging by the 96 tasset lames recovered from James Fort, these appear to have been discarded by the Jamestown colonists as well.

FIG. 4

James Fort: early breastplate, length 340mm (photograph, Michael Lavin, APVA).

FIG. 5

James Fort: gusset, length 240mm (photograph, Michael Lavin, APVA).

Tassets hung in pairs from the front of the breastplate and protected the upper thigh. The type found at Jamestown dates to the 16th century and consists of a number of narrow horizontal lames riveted together to form a skirt (Fig. 9). Tassets of the 17th century, which formed part of the pikeman's armour, are constructed of a single piece that simulates separate lames and contains rivets that serve no purpose. While not recovered from the James Fort excavations, this type has been found along with the earlier type of tasset on Maryland and Virginia sites dating to *c.* 1618–50.[33] Although the long tassets with knee-pieces that formed part of cuirassier armour have not been found at James Fort, a fauld lame, gauntlet, and couter from sealed *c.* 1610 contexts suggests that they were present in the early colony (Fig. 10). The fauld or skirt consisted of two or more lames

FIG. 6
James Fort: modified breastplate, length 390mm (photograph, Michael Lavin, APVA).

FIG. 7
James Fort: detail of alteration (photograph, Michael Lavin, APVA).

that were fastened to the bottom of the breastplate to protect the abdomen and to provide attachment points for the leg tassets. 'An integral part of cuirassier armour' by the 17th century, the fauld replaced an earlier use of mail.[34] The cuirassier was a heavily armoured cavalryman, equipped with a close helmet, gorget, breast- and backplate, vambraces, gauntlets, and tassets extending to the knees.

A single gauntlet for the right hand may also be part of cuirassier armour (Fig. 10:2). Found in the same context as the fauld [Structure 165], it consists of six articulated metacarpal plates, one extended to cover the thumb. A knuckle guard is riveted to the last plate and there are attachment holes for the missing finger and thumb lames.

Also indicative of these substantial suits of armour is the couter found in the *c.* 1610 Pit 1 of the fort (Fig. 10:3). The couter fits over the elbow and with the vambrace forms protection for the arm. Like the couter from Martin's Hundred, the piece has decorative roping along both edges and along the median ridge, indicating that it was originally part of armour that was of reasonable quality.[35]

The gorget is a plate protecting the neck area exposed between the breastplate and the helmet; it also supports the cuirass and allows attachment of the vambrace. It consists of a front and back plate, joined at the sides and worn under the breastplate. Ten gorgets have been found at Jamestown; all but two are in very fragmentary condition. Of these two gorgets, one comes from the *c.* 1610 context of Structure 165 and consists of a flat bib with a raised narrow neck collar enhanced by decorative roping (Fig. 11). The second (Fig. 12) was found, concreted to its backplate, in a *c.* 1617–25 well [Structure 170]. This is the only gorget backplate that has been found in the fort, suggesting that single front gorgets may have been worn without other plate armour.

Evidence for two types of helmet — the cabasset (also known as the Spanish morion) and the burgonet — have been found in James Fort.[36] Both are light helmets that, unlike the fully encasing close helmets, could be worn while aiming a firearm. They provided some, but not total, protection against Indian arrows, as illustrated by an account of an incident in 1611, in which an arrow hit the brim of Sir Thomas Dale's helmet 'which, if it had fallen a thought lower, might have shot him into the brains and endangered his life'.[37]

A complete cabasset was found in Pit 1, a context filled *c.* 1610 (Fig. 13). Used by European armies from the second half of the 16th century, the cabasset was initially a single-piece skull but was later formed in two pieces, as in the helmet from Pit 1, in which the pieces are overlapped and joined by riveting and hammering. The skull

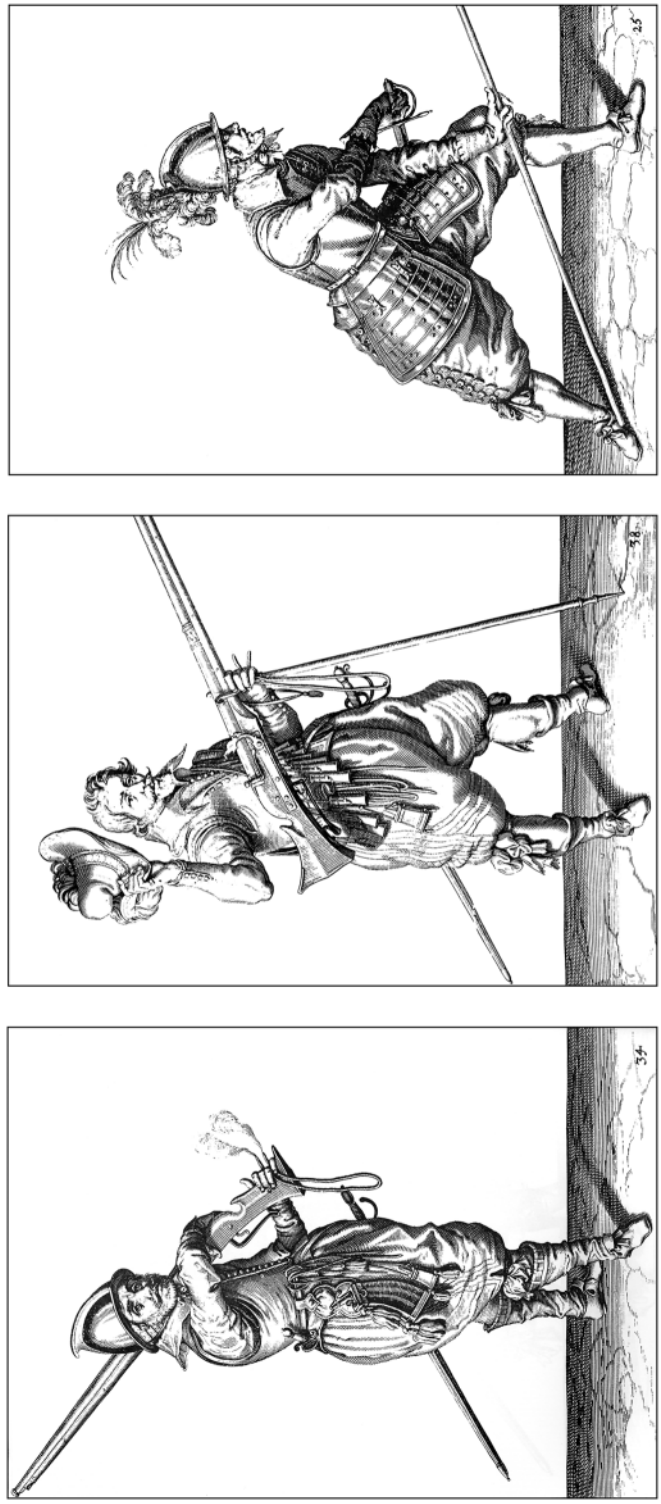

FIG. 8
De Gheyn illustrations of shot, musketeer and pikeman.

FIG. 9
James Fort: tasset, length 306mm (photograph, Michael Lavin, APVA).

is encircled by a brim at the base and typically narrows at the top in a small apical peak. The Pit 1 cabasset displays a row of holes just above the brim, which once held rivets securing the helmet lining and long triangular-shaped cheekpieces. These iron or brass rivets were often used with stamped brass rosette washers. Thirty-two washers have been found in the excavations, 25 of them in sealed contexts dating to *c.* 1610. Eighteen cheekpieces have also been found in four of the early fort features, along with fragments of helmets, indicating the early discard of protective headgear (Fig. 14). These cast-off helmets may be an outcome of the high mortality in colony, which resulted in 'moryons more then men' by the end of 1609.[38]

Like the cabasset, the burgonet is a light open helmet worn by both cavalry and infantry. It first appeared in the late 16th century and continued in use longer than the cabasset. Characterized by a comb along the centre-line of the skull and a brim over the eyes, it is usually equipped with neck protection. The burgonet was also fitted with hinged cheekpieces that were pierced with ventilation holes. A burgonet lacking its cheekpieces was found in a *c.* 1620s well [Structure 170] in the fort (Fig. 15). The burgonet does not appear to have been as popular as the cabasset at early Jamestown, as only three other burgonet cheekpieces have been recovered.

The excavated plate armour from Jamestown seems for the most part to be fairly average military-issue equipment, with occasional better-quality elements which are probably from the personal armour of the gentlemen. One such piece is represented by a scalloped breastplate edge with silvered rivets (Fig. 16). Found in the cellar of a fort building that was filled about 1610 [Structure 165], it is just one of many examples of cut-up or recycled plate armour found in the early fort contexts.

Jacks of plate and brigandines

Breastplate pieces exhibiting cut marks, found in association with small round and square plates, suggest that the colonists were recycling their heavy and uncomfortable plate armour for the manufacture or repair of defensive garments known as jacks of plate (Fig. 17). There are references as early as the mid-16th century to jack plates made of old armour, and the practice is

1

2

3

FIG. 10

James Fort: (1) Fauld; (2) Gauntlet; (3) Couter, lengths 306mm, 115mm and 90mm (photographs, Michael Lavin, APVA).

FIG. 11
James Fort: gorget, length 115mm (photograph, Michael Lavin, APVA).

FIG. 12
James Fort: front and back gorget, length 315mm (photograph, Michael Lavin, APVA).

FIG. 13
James Fort: cabasset helmet, height 230mm (photograph, Michael Lavin, APVA).

FIG. 14
James Fort: helmet washers, diams 11, 10 and 17mm and cheekpieces, lengths 91 and 110mm (photograph, Michael Lavin, APVA).

FIG. 15
James Fort: burgonet helmet, height 310mm (photograph, Michael Lavin, APVA).

FIG. 16
James Fort: scalloped breastplate fragment with silvered rivets, length 215mm (photograph, Michael Lavin, APVA).

FIG. 17

James Fort: breastplate fragment with jack plates, length 125mm (photograph, Michael Lavin, APVA).

FIG. 18

James Fort: jack made from breastplate, length 48mm (photograph, Michael Lavin, APVA).

often manifested by arbitrary holes left over from strap, lining or other attachments.[39] Not all the James Fort jack plates are available for study as they are still undergoing conservation, but at least four of them show signs of secondary use. One even preserves a section of the rolled edge from a breastplate neck or arm (Fig. 18).

Worn by the common soldier from the beginning of the 16th century, the jack of plate was a coat reinforced with small overlapping plates that were 'quilted and covered over with leather, fustian, or canvas'.[40] For the footsoldier, it provided more flexibility than the breastplate; and, unlike the slick surface of plate armour, it enabled him to cushion the butt of a firearm against his chest.

While use of the jack of plate was declining in Europe by the late 16th century, both the Spanish and the English continued to find it advantageous for wars with the Indians in the New World.[41] Brass and iron plates from the quilted coats known as *escaupiles* have been found on 16th-century Spanish sites throughout the south-eastern United States.[42] As late as 1600, a Spanish writer claimed that while Indian arrows could penetrate both buff coats and mail shirts, and rebound dangerously from heavy plate armour, 'it is clear that the *escupil* is the best armour because the arrow is stopped by it and sticks'.[43]

Writing from Virginia in 1613, the Revd Alexander Whittaker appears to have been referring to the jack of plate when he wrote, 'shirts of Male, or quilted cotton coates are the best defence' against the Virginia Indians.[44] So, even though they were old-fashioned by European standards and somewhat decayed by age, the 40 jacks of plate included in the King's 1622 gift would have been valued by the colonists in Virginia.[45]

One complete jack of plate was found recently in the cellar of a small lean-to shelter [Pit 8] constructed along the western palisade wall of James Fort (Fig. 19).[46] Five of these rudimentary structures have been excavated so far; they are interpreted as soldiers' cabins dating to the first few years of settlement. A total of 174 other jack plates were found scattered in the fort excavations. All but eight of the iron plates are square with cropped corners; the remainder are round.[47] All have pierced centres. About 75% of them are from sealed *c.* 1610 contexts. Since over 1,000 plates are required to make a complete jack, it is conceivable that all the jack plates are from a single garment.[48] A similar number of such plates were found at Beeston Castle in a context dating to the English Civil War. There it was considered that, because the jack was in use when it was over 50 years old, it would have been in quite fragmentary condition when discarded.[49] Many of the James Fort jack plates have been found in association with cut-up armour and appear to have been made on site,

FIG. 19
James Fort: Luke Pecoraro excavating jack of plate (photograph, Michael Lavin, APVA).

suggesting that they were repairs to disintegrating garments.

Two of the jack plates have secondary holes indicating that they may have been recycled from a related garment known as a brigandine. Unlike the jack of plate, which was primarily worn by soldiers, brigandines were worn by all social classes and could be constructed of rich materials such as velvet, silk, or leather. The brigandine consisted of overlapping rectangular plates that were riveted rather than sewn to the fabric of the doublet. The heads of the rivets were visible on the exterior of the garment and were often tinned or gilt to set them off from the textile.[50]

Ian Eaves has identified three types of rivet configuration on brigandines.[51] The first has a row of rivets along the top or bottom edge. It is the most common arrangement on the 68 brigandine plates found in the James Fort excavations (Fig. 20). The second pattern occurs on brigandines from the mid-15th century and consists of one row or more of rivets, with single rivets at one or both ends. One large 40mm-wide plate with clipped corners exhibits this pattern, but it has been punched in the centre for reuse as a jack plate (Fig. 21). The size of the plate indicates that the jack plate had been recycled from a brigandine dating from the mid- to late 15th century; brigandine plates from the 16th century tend to be about 20mm wide.[52]

The third type of construction, in which the rivets are in triangular groupings of three along the edge of the plate, is visible on three brigandine plates from the same early fort pit dating to *c.* 1610 [Pit 3]. This pattern is also seen on two surviving corners of a jack plate from the same context (Fig. 22). Similar jack plates were found in England at Beeston Castle, where they have been interpreted as remnants of recycled brigandine, and in Virginia in a *c.* 1619–22 context at Martin's Hundred.[53]

Mail

Mail is represented in the fort both by concretions of iron links (Fig. 23) and by single links of iron and brass. The condition of the mail makes it very difficult to identify construction methods, but most appear to consist of round-sectioned wire that has been flattened at the ends and riveted. The large iron concretions indicate mail shirts. Brass links were used to embellish the edges of the iron mail garments such as collars, sleeves, and shirts.[54]

As mentioned earlier, 'Shirts of Male' were declared to be an effective form of defence against Indian arrows in early 17th-century Virginia, but

FIG. 20

James Fort: brigandine Type 1, length 80mm (photograph, Michael Lavin, APVA).

FIG. 21 (above)

James Fort: brigandine Type 2, length 63mm (photograph, Michael Lavin, APVA).

FIG. 22 (left)

James Fort: brigandine Type 3, length 46mm (photograph, Michael Lavin, APVA).

they clearly had disadvantages. Even though mail was capable of stopping the penetration of an arrow, there was still the problem of splintering mentioned by the Spanish (above). Moreover, a mail shirt could weight 30lb (66kg), making deft manoeuvres difficult. In 1619, Edward Davies in *The Art of Warre* claimed that English soldiers wearing 'a heavie shirt of male' and a burgonet helmet 'are more apt to rest than readie to fight' after marching ten or twelve miles (16–19km) 'in the heat of summer or deepe of winter'.[55]

Pikes

The Virginia Company did not request pikes in 1622, even though the pike was an important weapon of European infantries at the time. It remained so until the mid-17th century, when improvements in the accuracy and range of fire-arms, coupled with the addition of the bayonet to the musket, spelled its demise.

A pole arm about 16 to 18ft (4.9–5.5m) in length with a small iron head, the pike was the most effective defence against cavalry forces. In European battles, massed squares of pikemen assumed braced positions with the left leg forward and bent, and the base of the pike supported against the right foot. While the pike was held in the left hand, a sword was wielded in the right (Fig. 8:3). A horseman who drew too near to this

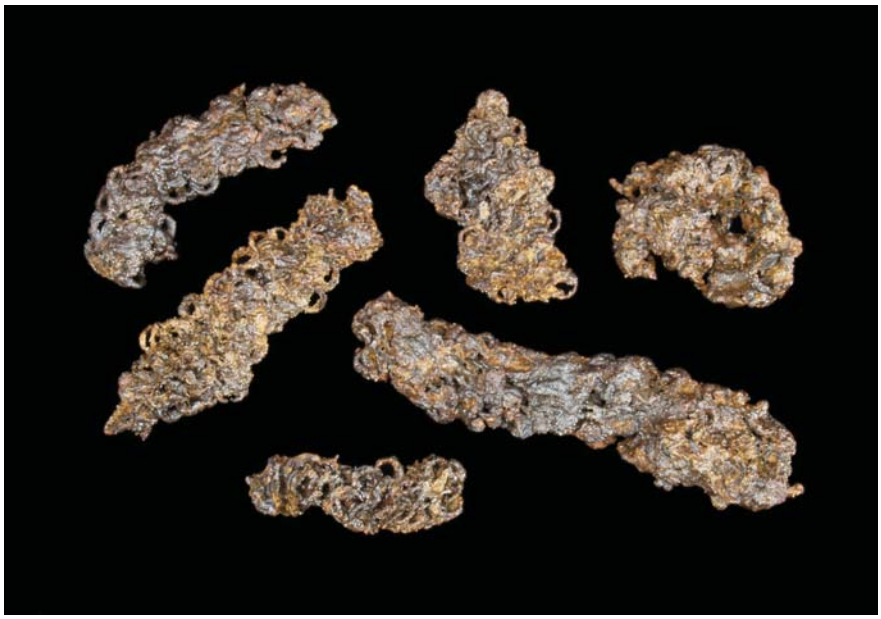

FIG. 23
James Fort: mail, length of largest concretion 148mm (photograph, Michael Lavin, APVA).

prepared position chanced impaling his mount on the pikes, rendering him vulnerable to the swinging swords of the infantry.

The pike, however, was not especially useful to the Jamestown soldiers, since an enemy on horseback did not confront them and, as previously mentioned, their principal engagements consisted of skirmishes with the Indians. According to colonist Henry Spelman, the Virginia Indians 'never fight in open fields, but always either among reed or behind trees'.[56] So warfare in Virginia, unlike the open battlefields of Europe, usually took place in the woods and tall underbrush, making the long staff weapon difficult to manoeuvre.

Even though 'pike-heads' are mentioned in the early records, there is no reference to their use at Jamestown, except as contraband in the forbidden underground trade with the Indians and as a punishment ('passing the pikes') for breaches of the martial laws established by Sir Thomas Dale in 1611.[57] As early as 1617, the pike appears to have been regarded as superfluous, as indicated by an example found in a *c*. 1611–17 fort well [Structure 177]; it had been fashioned into a hook, perhaps to retrieve the well bucket (Fig. 24). By this time it was apparently more useful as a tool than a weapon.

By the 1620s the colonists had almost abandoned the weapon and were unschooled in its use. This is indicated by a Virginia Company record of 1621 stating that colonist George Thorpe had requested a supply of pikes, 'wch weapon the maner of or peoples fightinge with the natives hath worne quite out of use'. Thorpe's concern was that the colonists might have to confront the Spanish, and would then have to revert to European methods of warfare using mass formations. He lamented, 'wee must fight wth him [the Spaniard] in his treanches wch hee that cann doe wth a Pike is a better Soldier then I'.[58] Thorpe's request appears to have been ignored, perhaps because the Indian attack of the following year made Indian warfare a bigger concern; pikes are absent from the weaponry listed in the 1624/25 muster of the colony.[59]

The iron heads to sixteen pikes have been recovered from James Fort (Fig. 25). They all are socketed, with two long iron straps or languets that secured them to the wooden (usually ash) shaft.[60] These straps also served to strengthen the pike in the area where it was most likely to break 'if the push be vigorous and the resistance considerable'[61] or if a swordsman landed a lucky blow.

The pike heads are not of the broad lozenge shape seen in Dutch sources of the period, but

FIG. 24
James Fort: pike bent into a hook, length to bend in languets 230mm (photograph, Michael Lavin, APVA).

FIG. 25
James Fort: pike heads, lengths 242 and 259mm (photograph, Michael Lavin, APVA).

instead are four-sided and square-sectioned above a decorative knop. This type is known as a boarding pike — a short staff weapon used aboard warships from the 16th to the 19th century.[62] The narrow blade was fashioned to fit through the grates covering the ship's hold so that sailors could defend positions from below deck and probe offensively the spaces in enemy ships.

Boarding pikes were considerably shorter than regular pikes and were therefore much more suitable for hand-to-hand combat. At between six and seven feet (1.8–2.1m) long, they were about the size of a spear; they were a thrusting weapon used by foot soldiers and 'ideally suited to both war and hunting'.[63]

As early as the 16th century, military spears were adapted to hunting spears by the addition of a detachable wood, horn, or iron crossbar below the blade. These crossbars prevented the weapon from penetrating too deeply into an impaled animal, thereby allowing the hunter to keep his distance. Without the crossbar, the impetus of the charging animal could allow it to 'run up the staff' and injure the hunter. At first the bars were fastened securely to the staff; later it was discovered that a loose toggle 'was still effective and was not so liable to cause accidental injury to the hunter or his companions'.[64]

One of the Jamestown pike heads has been reworked for use as a hunting spear by fitting an iron ferrule with a projecting 38mm prong on each side over the pike blade (Fig. 26). This weapon, which is unique among American finds, could have been fashioned to hunt the colony's stock of pigs that had been allowed to run feral on nearby Hog Island. It represents the adaptation of a weapon with a tenuous use in the frontier environment of Virginia into a much-needed tool for acquiring food.

Bills

As mentioned previously, about 500 bills from the king's armoury were given to the Virginia colony after the massacre of 1622. Nine bills have been excavated at Jamestown; they may all result from this gift, since none were found in the early fort features (Fig. 27). Four of them are from late 17th-century contexts relating to the last statehouse on the island [Structure 144], which burned in 1698. This late context reflects the changing role of the bill during the 17th century, from weapon to ceremonial arm. The Jamestown bills were probably mounted on an interior wall of the statehouse in a panoply of arms representing the strength and power of government.

A staff weapon, the bill was derived from the billhook, an agricultural tool used to prune trees and slash brush. Its heavy scythe-shaped blade has a short dorsal spike and a longer terminal spike. Attachment to the staff was by a socket rather than languets.

Believed to have originated in Italy in the 13th century, the bill was not commonly issued to large organized armies in Europe, even though it required no specialized training to be used effectively. Instead, the weapon was supplied to small local fighting forces. Humphrey Barwick, writing in 1594, claimed that the bill was relegated to contingents of 'common countrie men who were unschooled in the use of the more efficacious halberd'.[65]

The increased reliance of armies on protective armour, coupled with the development of firearms, resulted in the bill falling into disuse by the time the colonists first set foot on Jamestown Island.[66] While the use of the bill is documented by Royalist forces as late as the English Civil Wars, it is believed that its resurgence resulted primarily from the short supply of more conventional staff weapons.[67]

Bows and crossbows

The recent excavations of James Fort have shown that, while the colonists may have been reluctant to have bows and arrows in 1622, they felt otherwise during the early years of the settlement. Twenty iron projectile points have been found; they constitute the first material evidence of longbow use in English America.[68] It is very difficult to distinguish between points for the longbow and the crossbow because very few projectiles have been found with their original shafts,[69] but, based upon weight and/or socket diameter, all but two of the projectile points appear to be for arrows.

Two of the arrowheads are socketed forms with blunted heads, traditionally associated with archery practice. They were both found in the sealed *c.* 1610 context of Pit 1. One of the points (Jessop Type MP9) is short and conical and has been found on English sites dating from the 12th to the 16th century (Fig. 28:1).[70] The second point in this category (Jessop Type MP10) is bullet-shaped and larger (Fig. 28:2). It has been found in contexts dating from the 16th to the 18th century.[71] There is no mention in the documentary records of the Jamestown colonists practising their archery, but since constant practice was required to be proficient at the bow, it is likely that they did so.

Another arrowhead is triangular and has a pronounced central reinforcing spine (Fig. 28:3). It

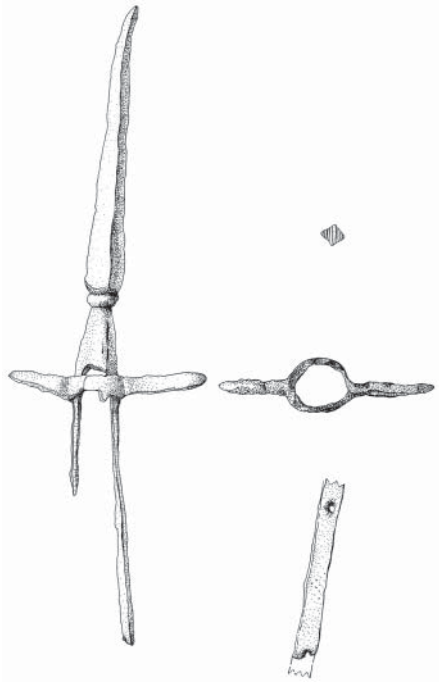

FIG. 26
James Fort: boar spear, length 320mm (drawn by Caroline Taylor, APVA).

FIG. 27
James Fort: bill, length 470mm (photograph, Michael Lavin, APVA).

is tanged rather than socketed and, just where the tang is broken off, it appears to be twisted. Forms such as these, that would have been screwed into the wooden shaft of the arrow rather than fitted over it, are found on English sites dating between the 9th and 11th century.[72] It is unlikely that the Jamestown arrowhead dates to this early period, and its presence in a post-medieval context is an anomaly in the established typology of English arrowheads.

Two crossbow bolt quarrels are also atypical of the examples current in the English record of the early 17th century. The first is pyramidal and socketed, and appears to be a point within a point (Fig. 28:4). The evidence of copper on the upper part suggests that the two points may have been brazed together. The upper and outer quarrel also has a scalloped edge not seen on the inner quarrel; this may represent an additional method of attaching the two points together. This object appears to be a reinforced crossbow quarrel. Certainly it would not be required in hunting, where the largest animal to be encountered would have been the deer. It seems rather to be designed for warfare; it

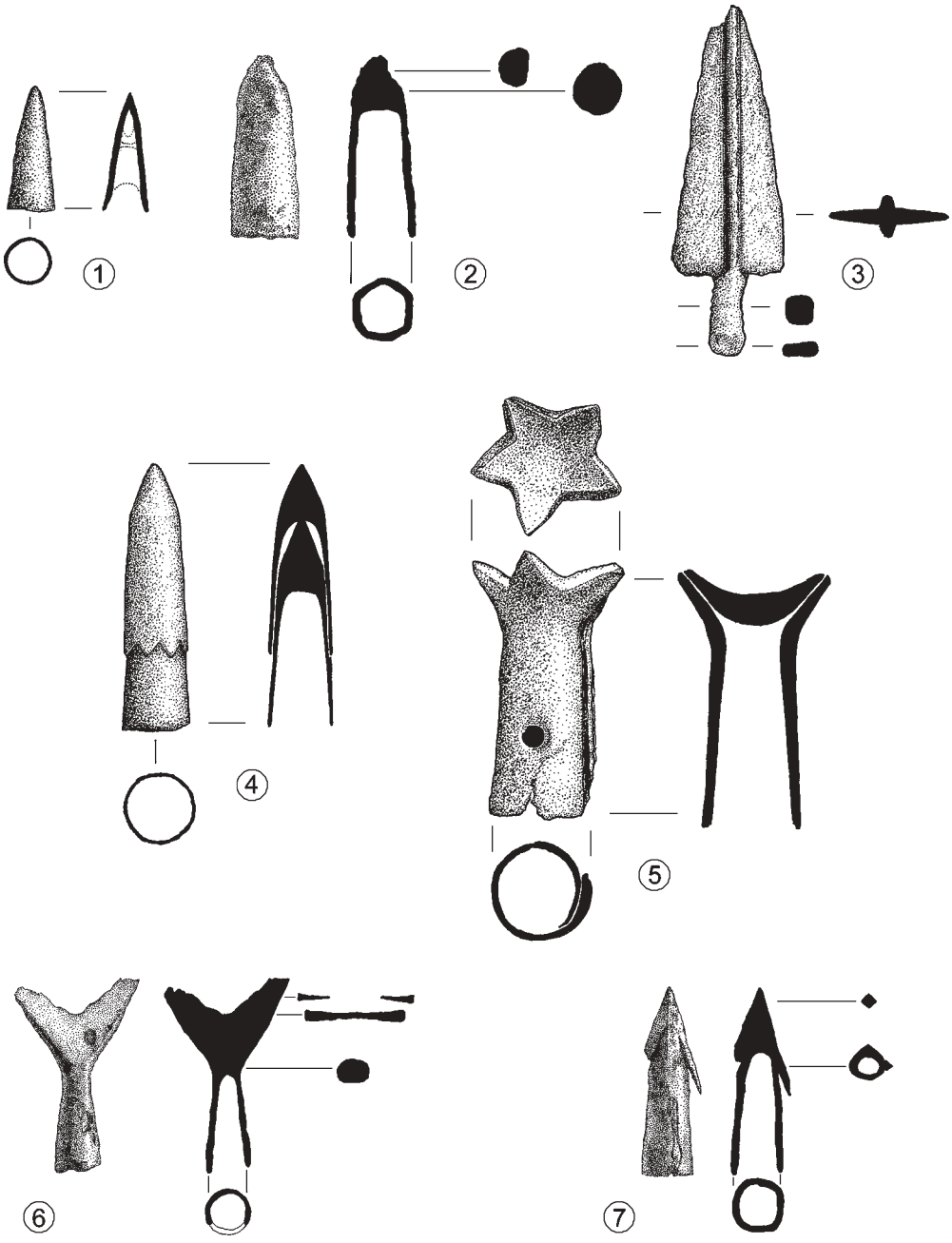

FIG. 28
James Fort: arrow and crossbow points (drawn by Caroline Taylor, APVA).

may have been of the strength needed to pierce armour.

Another crossbow bolt quarrel appears to be of the type used for hunting. It is a large robust socketed point with a coronal head of five points (Fig. 28:5). There is a single attachment hole on the shaft for securing the quarrel to the wooden bolt. Crossbow bolts with large, heavy heads like this would not travel a great distance. The point was designed to batter and stun an animal at close range, without penetrating the skin and damaging the fur. Its association with hunting is also suggested by its similarity to the *Krönenbolzen* or crowned quarrels used in a form of competition especially popular on the Continent, in which the target resembled a bird, also known as a popinjay.[73]

Six of the projectile points from James Fort are hunting arrowheads known as forkers (Fig. 28:6). V-shaped with sharpened inner blades, these points (Jessop Type H2) were designed to cut the wings or necks off fowl and to hamstring deer and small animals.[74] Forkers had been known since the late 14th century; they are commonly found on English late medieval and later sites.[75]

Three other points are barbed and are of a military form used from the 15th to the 17th century (Jessop Type M2).[76] While one was found in ploughsoil, two are from tightly sealed *c.* 1610 contexts in the fort. The conical points have short barbs created by the addition of triangular pieces of iron that are brazed on and then cut up from the base to create the wings (Fig. 28:7).

Firearms

The king's 'princely gift' in 1622 included 700 calivers, 300 short pistols with fire locks, and 300 harquebuses. These firearms appear to represent the three different types of ignition system used in the 17th century: the matchlock (caliver), wheel-lock (harquebus), and snaphaunce (fire-lock).

The matchlock was the most commonly used military arm at the time because it was a simple mechanism and relatively inexpensive to maintain and repair. It worked well on European battlefields, where it was used to fire volleys of shot into massed formations. The matchlock's primary disadvantage was the dependence on matchcord for ignition. To be assured of lighting the gunpowder, soldiers kept both ends of their match alight whenever they were likely to use their guns. With matchcord burning at a rate of nine inches (0.22m) an hour, they expended great lengths of fuse which had to be imported from England, whether the gun was fired or not.[77]

Eighteen matchlocks have been excavated so far from James Fort; the two types of trigger mechanism used on guns at this date are represented equally. The earlier type is the sear lock, which was developed in the mid-15th century, borrowing technology from the crossbow (Fig. 29). In this device, the serpentine holding the burning matchcord was rotated down onto the pan of gunpowder by applying pressure to an L-shaped lever screwed into the end of the internal sear. Production of matchlocks with sear locks is thought to have ended by the third decade of the 17th century.[78]

By 1599, matchlocks were also made using a conventional trigger mounted in the stock, separate from the lock (Fig. 30).[79] This innovation had advantages over the sear lock in that 'the lock could be easily removed; the trigger could be enclosed within a guard to prevent accidental firing; and an easier grip gave a better aim'.[80]

It is possible to determine the type of trigger fitted to a matchlock, even if only the lockplate remains. On the trigger lock, the slot for the sear spring will be positioned beneath the sear and near the serpentine, whereas on the sear lock the spring will be mounted over the sear and close to the trigger end.

Matchlocks were mounted on two types of firearm — the musket and the caliver. The musket was about five feet (1.5m) long and could weigh up to 20 pounds (9kg). A forked rest, such as the 30 that have been found in James Fort contexts, was required to steady and fire the unwieldy firearm. They are all of similar construction, consisting of a U-shaped fork with curling terminals, and a separate ferrule that is secured to the fork's scale tang by a screw eye (Fig. 31).

Calivers were matchlock guns that were smaller and lighter than muskets, weighing only 12 to 15lb (5.4–6.8kg), and needed no rest. Because the caliver was smaller than the musket, it did not have as great a range and was generally abandoned for military use by the early 17th century. This may be one reason the Royal Armoury had '700 calivers' that were described as obsolete in 1622.[81]

Like 'caliver', the term 'harquebuse' or 'arquebus' usually refers to a gun lighter than a musket that can be fired without need of a musket rest. From the 16th century it was often used to describe a gun with a wheel-lock ignition system.[82] Only two wheel-locks have been found in James Fort, one (represented by a bridle only) from a disturbed earthwork context, the other (consisting of the lockplate and cock) from the *c.* 1610 context of Structure 165 (Fig. 32).

Unlike the matchlock, the wheel-lock was a self-igniting firearm that produced a spark from iron pyrites, held against a spinning wheel. While

FIG. 29
James Fort: Matchlock sear lock, length 400mm (photograph, Michael Lavin, APVA).

FIG. 30
James Fort: matchlock trigger lock, length 200mm (photograph, Michael Lavin, APVA).

this provided an advantage over the matchcord-dependent matchlock, the wheel-lock was an expensive firearm that was much more complicated to operate and was prone to jamming. By the 1640s most of Europe had abandoned the military use of the wheel-lock in favour of flintlock weapons, although it remained the standard weapon of wealthy sportsmen.[83] It is possible that the James Fort wheel-locks were personal arms of gentlemen.[84]

The '300 short pistols with fire locks' may have been of the early form of flintlock known as a snaphaunce.[85] Like the wheel-lock, the snaphaunce was self-igniting but was much less complicated to operate. It needed no spanner to wind a wheel for ignition. Instead, the spark was created by flint held by a forward-falling cock, striking the steel over the priming powder as the trigger was pulled. Whereas the matchlock continued as popular military issue in Europe through the 17th century, it was replaced in Virginia with flint-ignition arms by the second quarter of the century.[86]

Elements of at least fourteen snaphaunces have been uncovered in the James Fort excavations. Nine are from sealed early fort deposits; six of these are probably from hunting guns known as fowlers (Fig. 33). The snaphaunce fowler had a range of about 200m; it was 'easily turned into a military arm for the defence of or attack on fortified positions'.[87]

The early colonists appear to have been quite proficient in using their guns, especially in hunting birds. John Smith records that on one occasion he and two other colonists killed 148 fowl with

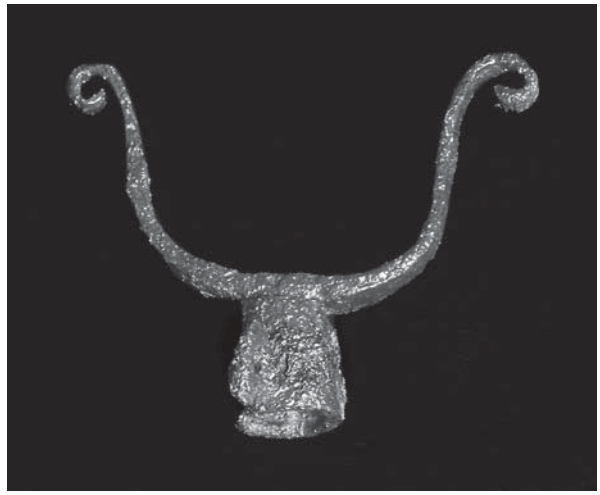

FIG. 31
James Fort: musket rest, length 100mm (photograph, Michael Lavin, APVA).

FIG. 32
James Fort: wheel-lock, length 265mm (photograph, Michael Lavin, APVA).

FIG. 33
James Fort: snaphaunce lockplate, length 210mm (photograph, Michael Lavin, APVA).

just three shots each.[88] The Indian chief Powhatan was seemingly impressed with this application of the colonists' firepower, for he requested that an Englishman live in his village Werowocomoco for the express purpose of shooting fowl.[89]

A right-hand pistol lockplate from the south palisade of the fort and a matching cock from a left-hand gun indicate a pair of snaphaunce pistols (Fig. 34). Characteristics of the cocks, including the ornamental comb and the jaws, which are operated by a screw that enters from below and is secured by a nut above, indicate that the pistols are Scottish. These are civilian firearms; they probably belonged to one of the gentlemen of the colony, 'for the Scottish pistol was not so much a weapon . . . but a badge of rank'.[90]

A third snaphaunce pistol, complete with its wooden stock, has recently been recovered from the fort's *c.* 1611–17 well [Structure 177]. It is presently undergoing conservation and was not available for this study, but this also has many features that indicate it is Scottish. The brass barrel has flattened sides, the button trigger has no guard, and the wooden stock is of fishtail form.[91] It closely resembles the pair of pistols in the Royal Armoury, Madrid, that are candidates for being the earliest known Scottish firearms.[92] Interestingly, an X-ray of the piece before it was submitted for conservation showed that the barrel still contains its load of two lead shot (Fig. 35).

CONCLUSIONS

Since new excavations began at James Fort twelve years ago, nearly one million artefacts have been uncovered, including the largest collection of late 16th- to early 17th-century arms and armour from English America. Most of the weaponry is from tightly sealed contexts that can be dated within three to ten years after the colony's founding in 1607. This makes James Fort an invaluable

FIG. 34
James Fort: pair of snaphaunce pistols, lengths 121mm and 83mm (photograph, Michael Lavin, APVA).

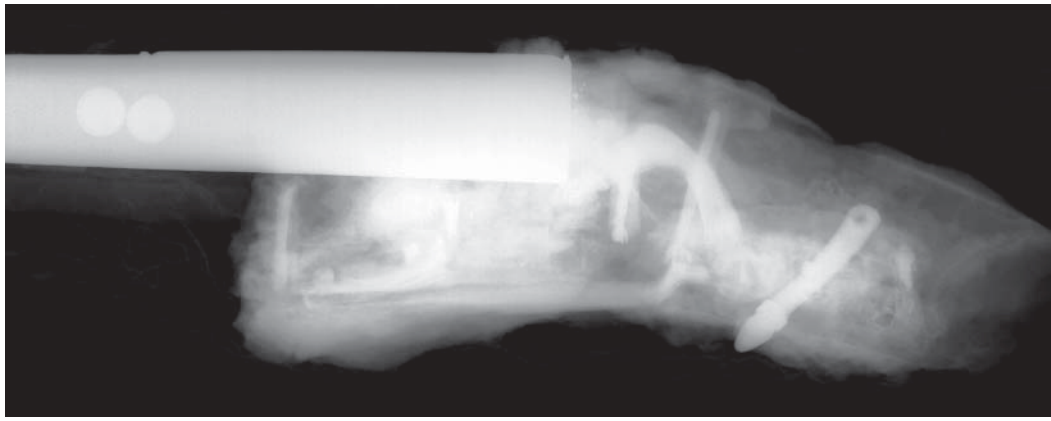

FIG. 35
James Fort: X-ray of pistol (photograph, Michael Lavin, APVA).

resource for scholars of early 17th-century material culture.

The arms and armour brought by the early Jamestown colonists were both new and old, personal possessions and military issue. The weapons served the Englishmen well as they secured the toehold in the New World that became their first lasting colony. Body defences that were no longer useful on European battlefields to soldiers facing firearms were adequate protection against Indian arrows. The colonists saw value in the skirmishing arms considered obsolete by soldiers engaged in modern tactics involving pitched battles on open fields. They adapted the long pike, which was the mainstay of English infantry forces, to the half pike that was more suitable for close combat. They relied primarily on the matchlock in the early years but the snaphaunce soon took precedence as its practicality in frontier conditions became evident.

This discussion of the arms and armour of James Fort has been, of necessity, just a summary of some of the finds. The vast collection of edged weaponry, for instance, has been left out of this study, as has the array of military accoutrements. A more complete report on James Fort's arms and armour is planned for the future when the fort site has been more completely excavated and the objects have been fully conserved.

ACKNOWLEDGEMENTS

Special recognition must go to Jamestown Rediscovery colleagues involved in this publication: Michael Lavin and Dan Gamble for their excellent conservation work on the arms and armour of James Fort, Michael Lavin for the photography, Caroline Taylor for the illustrations, and Jamie May for enhancing the images for publication.

NOTES

[1] Kingsbury 1906–35, **3**, 551.
[2] Kingsbury 1906–35, **2**, 96.
[3] The Virginia Company of London was a joint stock company that was granted a royal charter by James I in 1606 to settle Virginia.
[4] Sackville 1922, 504.
[5] Kingsbury 1906–35, **3**, 676; **2,** 99–100.
[6] Colonist Ralph Hamor claimed that when Sir Thomas Dale, Deputy Governor and Marshal of Virginia, arrived at Jamestown, the men were at their 'daily and usuall works bowling in the streets' (Barbour 1986, **2**, 239).
[7] For discussion of Plymouth's ascendancy over Jamestown, see Horn 2005, 288–90. For the traditional historical view of Jamestown see Taylor 2001; Morgan 1975; Ver Steeg 1964.
[8] Courtney 1993; Credland 1983; Dufty 1971.
[9] Lavin 2000, 4.
[10] Barbour 1986, **1**, 166.
[11] Malone 1990, 17.
[12] Barbour 1986, **1**, 85.
[13] Kenyon 1998, 3.
[14] Courtney 2001, 111.
[15] Brown 1890, 895.
[16] Edwards & Blair 1982, 74–115.
[17] Holme 1688, **2**, 5.
[18] *The Pleasant historie of the two angrie women of Abington*, cited in Norman 1980, 25.
[19] Edwards & Blair 1982, 84.
[20] Edwards & Blair 1982, 83.

[21] Sackville 1922, 504.
[22] Blackmore 1990, 44.
[23] Brown 1890, 328; Barbour 1986, **2**, 326.
[24] Peterson 1956, 141–2.
[25] Barbour 1986, **2**, 311.
[26] Donald J. La Rocca, pers. comm. 1999.
[27] Noël Hume 2001, 391, 399. Seven backplates found on Virginia sites also contain brass rivets. Four are from Martin's Hundred, *c.* 1620–22 (Noël Hume 2001, 391, 399) and three from Jordan's Journey, *c.* 1620–35 (Straube 1996, 106).
[28] Besides the one from Structure 177, a brick-lined well located just outside the palisade walls of James Fort, one other modified breastplate was found on Jamestown Island; it came from the New Towne area (Cotter & Hudson 1957, 73). The third breastplate is from Jordan's Journey, a *c.* 1620–35 settlement in Prince George County, Virginia (Straube 1996).
[29] Strachey 1836–46, 32.
[30] Roberts & McBride 1989, 18–19.
[31] Percy 1613, 514–15.
[32] Blackmore 1990, 63–4.
[33] Both types of tasset were found in excavations of *c.* 1635–50 at Pope's Fort (Fithian 1987) and *c.* 1618–25 at Governor's Land (Outlaw 1990, 135–9).
[34] Tarrasuk & Blair 1986, 440.
[35] Noël Hume 2001, 455–6. An arm defence consisting of a vambrace and couter was excavated from the site of James Fort during the Civil War construction of Confederate earthworks. It is in the Virginia Historical Society collections in Richmond, VA.
[36] Helmets recovered from early Virginia sites include two close helmets and one burgonet from *c*. 1620–22 from Martin's Hundred (Noël Hume 2001, 393–7 and 388), a cabasset and a burgonet (cheekpiece misidentified as a pauldron) of *c.* 1618–25 from Governor's Land (Outlaw 1990, 133 and 136), a burgonet from Flowerdew Hundred (Hodges 1981), a burgonet of *c.* 1620–35 from Jordan's Journey (Lavin 2000, 7), a cabasset from an early 17th-century site in Yorktown (Peterson 1956, 113), and a cabasset from a second quarter of the 17th century context near Jamestown (Cotter & Hudson 1957, 71 and 73).
[37] Percy 1613, 514.
[38] Barbour 1986, **1**, 273.
[39] Eaves 1989, 135.
[40] Harrison 1994, 235.
[41] A jack of plate was found in an English Civil War context at Beeston Castle, where it was interpreted as antique armour that was used out of necessity (Eaves 1989, 81–154; 1993, 11–164).
[42] South *et al.* 1988, 115–17. According to personal communication from Dr James D. Lavin, the Spanish word *escaupile* may have developed from *huipil*, an Aztec word for a formless woman's dress. The early form of jack of plate was less like a form-fitting doublet than 'a poncho-like garment with the metal segments riveted inside a textile covering' (Mayes & Butler 1983, 266).
[43] Quinn 1991, **2**, 831. The best e*scaupiles* were described as cotton. Early 17th-century Spanish explorers in America mention the use of loose jackets made of 'quilted cotton three finger-breadths in thickness' (de la Vega 1605, 236, 367). It is not clear whether these were reinforced with metal plates. The earliest jacks were quilted garments made of layers of fabric, but these are thought to have gone out of use by the end of the 16th century.
[44] Whittaker 1937, 4. See previous note for discussion of cotton jacks.
[45] Forty 'Jackes of plate' are recorded in the Armouries of the Tower of London in 1603/4 and are probably the same 40 garments given to the Virginia Company nineteen years later (Eaves 1989, 148). A complete jack of plate recovered from Jordan's Journey, a fortified settlement in Prince George County, VA, dating to *c.* 1620–35, is probably part of this gift.
[46] This find was undergoing conservation and not available for analysis at the time of publication.
[47] It is possible that these round plates belong to another type of late 16th-century plated armour called a 'pennyweight coat' constructed of overlapping discs riveted to canvas (Blair 1958, 139).
[48] Eaves 1989, 90.
[49] Eaves 1993, 162–3.
[50] Eaves 1989, 83–4.
[51] Eaves 1989, 93–4.
[52] Eaves 1989, 93.
[53] Eaves 1989, 94, pl. 36A–B; Noël Hume 2001, 2, 429 and 431. Noël Hume believes that the three-hole configuration may relate to jack coat design rather than being reused brigandine.
[54] Mail consisting of brass links attached to iron links has been found in a *c.* 1620–22 context at Martin's Hundred (Noël Hume 2001, 385, 387).
[55] Ffoulkes 1988, 90.
[56] Spelman 1998, 494.
[57] Barbour 1986, **2**, 187, 199; Strachey 1612, 21–2.
[58] Kingsbury 1906–35, **3**, 447.
[59] Meyer & Dorman 1987, 7–71.
[60] The pike found in the well [Structure 177] was still attached to a section of its ash staff.
[61] Roger Boyle's *Treatise of the Art of War* (1677), cited in Blackmore 1990, 75.
[62] J.B. Kist, pers. comm. 1998.
[63] Fliegel 1998, 124.
[64] Blackmore 1971, 91.
[65] Barwick 1974, 23.
[66] Tarrasuk & Blair 1986, 83–4.
[67] Blackmore 1990, 81.
[68] While no crossbow bolts have previously been recovered from sealed archaeological deposits in Virginia, a goat's foot lever from a 17th-century sporting crossbow was recovered in the 1950s from a site associated with Jamestown's governor from 1642–52 and 1660–77 (Peterson 1956, 10).
[69] Courtney 1993, 157.

[70] Jessop 1996, 197.
[71] Jessop 1996,197.
[72] Jessop 1996, 195.
[73] Alm 1934, 62–3.
[74] Blackmore 1971, 149, 194.
[75] Jessop 1996, 199–200; Dufty 1971, 53–4.
[76] Jessop 1996, 198.
[77] Malone 1990, 32.
[78] Blair 1983, 63.
[79] This is the type of trigger on matchlocks depicted in De Gheyn's 1607 *Exercise of Armes*, which are based on 1599 models (Kist 1971, 30).
[80] Blackmore 1961, 18.
[81] The Dutch army stopped using calivers in 1609 (Kist 1971, 25).
[82] Tarrasuk & Blair 1986, 47.
[83] Rimer 2001, 18.
[84] Two wheel-lock plates and eight military spanners have been uncovered from parts of Jamestown owned by the National Park Service and dating mainly to the second half of the 17th century.
[85] The term 'fire lock' has been applied to both the wheel-lock and snaphaunce in early records.
[86] Peterson 1956, 49.
[87] Blackmore 1971, 291.
[88] Barbour 1986, **2,** 194.
[89] Barbour 1986, **2**, 199.
[90] Boothroyd 1981, 35.
[91] Blair & Woosnam-Savage 1995, 10.
[92] Blair & Woosnam-Savage 1995, 6.

BIBLIOGRAPHY

PUBLISHED SOURCES

Alm, J. 1934, *European Crossbows: a Survey*, London: Royal Armouries.

Barbour, P.L. (ed.) 1986, *The Complete Works of Captain John Smith (1580–1631)*, 3 vols, Chapel Hill (NC): University of North Carolina Press.

Barwick, H. 1974 [1594], *A Breefe Discourse, Concerning the Force of All Manuall Weapons of Fire*, Norwood (NJ): Walter J. Johnson.

Blackmore, D. 1990, *Arms & Armour of the English Civil Wars*, London: Royal Armouries.

Blackmore, H.L. 1961, *British Military Firearms 1650–1850*, London: Herbert Jenkins.

Blackmore, H.L. 1971, *Hunting Weapons*. Mineola (NY): Dover.

Blair, C. 1958, *European Armour, circa 1066 to circa 1700*, London: Herbert Jenkins.

Blair, C. (ed.) 1983, *Pollard's History of Firearms*, Rushden: Country Life Books.

Blair, C. & Woosnam-Savage, R. 1995, *Scottish Firearms*, Bloomfield (OT): Museum Restoration Service.

Boothroyd, G. 1981, 'The birth of the Scottish pistol', in Caldwell 1981, 315–38.

Brown, A. 1890, *The Genesis of the United States*, Boston (Mass): Houghton, Mifflin.

Caldwell, D.H. 1981, *Scottish Weapons and Fortifications 1100–1800*, Edinburgh: John Donald.

Clayton, L.A., Knight, V.J. & Moore, E.C. (eds) 1993, *The De Soto Chronicles,* 2 vols, Tuscaloosa (AL): University of Alabama Press.

Cotter, J.L. & Hudson, J.P. 1957, *New Discoveries at Jamestown*, Washington (DC): US Government Printing Office.

Courtney, P. 1993, 'The medieval and post-medieval objects', in Ellis 1993, 134–61.

Courtney, P. 2001, 'The archaeology of the early-modern siege', in Freeman & Pollard 2001, 105–15.

Credland, A.G. 1983, 'Military finds', in Mayes & Butler 1983, 259–66.

Davies, E. 1988 [1619], *The Art of Warre*, in Ffoulkes 1988, 90.

De Gheyn, J. 1971 [1607], *The Exercise of Armes*, New York: McGraw Hill.

de la Vega, G. 1605, 'La Florida', in Clayton *et al.* 1993, 25–588.

Dufty, A.R. 1971, 'The military equipment', in Moorhouse 1971, 52–4.

Eaves, I. 1989, 'On the remains of a jack of plate excavated from Beeston Castle in Cheshire', *J. Arms & Armour Soc.* **18**, 81–154.

Eaves, I. 1993, 'The jack of plate', in Ellis 1993, 161–4.

Edwards, I. & Blair, C. 1982, 'Welsh bucklers', *Antiquaries J.* **62:**1, 74–115.

Ellis, P. (ed.) 1993, *Beeston Castle, Cheshire*, London: English Heritage.

Fliegel, S.N. 1998, *Arms & Armor: the Cleveland Museum of Art*, Cleveland (OH): Cleveland Museum of Art.

Ffoulkes, C. 1988, *The Armourer and his Craft from the XIth to the XVIth Century*, New York: Dover.

Force, P. (ed.) 1836–46, *Tracts and Other Papers*, 4 vols, Washington (DC): Peter Force.

Freeman, P.W.M. & Pollard, A. 2001 (eds) *Fields of Conflict: Progress and Prospect in Battlefield Archaeology*, Brit. Archaeol. Rep. Int. Ser. **958**.

Haile, E.W. 1998, *Jamestown Narratives: Eyewitness Accounts of the Virginia Colony*, Champlain (VA): Roundhouse.

Harrison, W. 1994 [1587], *The Description of England* (ed. G. Edelen), New York: Dover Books.

Horn, J. 2005, *A Land as God Made It*, New York: Basic Books.

Jessop, O. 1996, 'A new artefact typology for the study of medieval arrowheads', *Medieval Archaeol.* **40**, 192–205.

Kenyon, J. 1998, 'The background to the civil wars in the Stuart kingdom', in Kenyon & Ohlmeyer 1998, 3–40.

Kenyon, J. & Ohlmeyer, J. (eds) 1998, *The Civil Wars*, Oxford: University Press.

Kingsbury, S.M. (ed.) 1906–35, *The Records of the Virginia Company*, 4 vols, Washington (DC): Government Printing Office.

Kist, J.B. 1971, 'A commentary' in De Gheyn 1971, 3–48.

Lavin, J. 2000, *Arms and Armor of 17th-Century Virginia*, Williamsburg (VA): Jamestown–Yorktown Foundation.

Malone, P.M. 1990, *The Skulking Way of War: Technology and Tactics among the New England Indians*, New York: Madison Books.

Mayes, P. & Butler, L. 1983, *Sandal Castle Excavations 1963–1973*, Wakefield Historical Pub.

Meyer, V.M. & Dorman, J. 1987, *Adventurers of Purse and Person, Virginia, 1607–1624/5*, 3rd edn, Richmond (VA): Order of the First Families of Virginia.

Moorhouse, S. 1971, 'Finds from Basing House (*c*. 1540–1645) Part 2', *Post-Medieval Archaeol.* **5**, 35–76.

Morgan, E.S. 1975, *American Slavery, American Freedom: The Ordeal of Colonial Virginia*, New York: W.W. Norton.

Noël Hume, I. 2001, *The Archaeology of Martin's Hundred*, 2 vols, Williamsburg (VA): Colonial Williamsburg Foundation.

Norman, A.V.B. 1980, *The Rapier and the Small-Sword, 1460–1820*, New York: Arno Press.

Outlaw, A.C. 1990, *Governor's Land: Archaeology of Early Seventeenth-Century Virginia Settlements*, Charlottesville (VA): University Press of Virginia.

Percy, G. 1613, '"A Trewe Relacyon", Virginia from 1609 to 1612', in Haile 1998, 497–519.

Peterson, H.L. 1956, *Arms and Armor in Colonial America 1526–1783*, New York: Bramhall House.

Quinn, D.B. 1991, *The Roanoke Voyages 1584–1590*, 2 vols (reprint), New York: Dover Publications.

Rimer, G. 2001, *Wheel-lock Firearms of the Royal Armouries*, Leeds: Royal Armouries.

Roberts, K. & McBride, A. 1989, *Soldiers of the English Civil War 1: Infantry*, Elite Ser. **25**, London: Osprey.

Sackville, R. 1922, 'Lord Sackville's papers respecting Virginia, 1613–1631' **1**, *Amer. Hist. Rev.* **27**:3, 493–538.

South, S., Skowronek, R. & Johnson, R. 1988, *Spanish Artifacts from Santa Elena*, Archaeol. Stud. **7** Occ. Pap. S. Carolina Instit. Archaeol.

Spelman, H. 1998 [1609], 'Relation of Virginia, 1609', in Haile 1998, 481–95.

Strachey, W. 1836–46 [1612], 'For the colony in Virginea Britannia. Lavves diuine, morall and martiall, &c.', in Force 1836–46, **3**, 2–62.

Tarrasuk, L. & Blair, C. (eds) 1986, *The Complete Encyclopedia of Arms and Weapons*, New York: Bonanza Books.

Taylor, A. 2001, *American Colonies: The Settling of North America*, New York: Penguin.

Ver Steeg, C.L. 1964, *The Formative Years 1607–1763*, New York: Hill & Wang.

Whittaker, A. 1937 [1613], *Good Newes from Virginia*, Delmar (NY): Scholars Facsimiles & Reprints.

UNPUBLISHED SOURCES

Fithian, C.H. 1987, '"Master Pope's Fort": an English Civil War Fortification on the Chesapeake Frontier', paper presented at the Society for Historical Archaeology Conference on Historical and Underwater Archaeology, Savannah, Georgia.

Hodges, C.T. 1981, 'Notes on Arms and Armor at 44PG65', Flowerdew Hundred Foundation.

Holme, R. 1688, 'The Academy of Armory', Ann Arbor (MI): Xerox University Microfilms.

Straube, B.A. 1996, 'Finds from Jordan's Journey', prepared for the Virginia Department of Historic Resources.

Straube, B. & Luccketti, N. 1996, '1995 Interim Report', APVA.

ABBREVIATIONS

APVA Association for the Preservation of Virginia Antiquities

1367 Colonial Parkway, Jamestown, Virginia 23081, USA [bly@apva.org]