THE ARCHAEOLOGICAL INVESTIGATION OF A SEVENTEENTH-CENTURY BLACKSMITH SHOP AT FERRYLAND, NEWFOUNDLAND

MATTHEW CARTER

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by

Matthew Carter

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Abstract

This thesis deals with a blacksmith shop which operated at Ferryland during the first half of the seventeenth century. First discovered during the summer of 1984 in an area of Ferryland commonly referred to as the "Pool" the smithy was not completely excavated until the 1994 field season. Many of the features and artifacts were analysed to determine the structural characteristics and general layout of the shop in addition to the kinds of activities in which the blacksmiths were engaged. It will be shown that this smithy was likely built in 1622 by Captain Edward Wynne and his eleven colonists.

Structural characteristics of the shop include a wooden frame building having both a dirt floor and a slate roof. The positions of such features as the anvil, forge, bellows and slack tub were clearly visible and helped to determine the layout of the smithy. Blacksmiths in the seventeenth and eighteenth centuries commonly practised a number of different trades. This was evidently the situation at Ferryland since the artifact analysis determined that the smiths were also farriers, coppersmiths, locksmiths and gunsmiths as well as blacksmiths. Evidence for these trades is discussed in chapter six.

The final section of this thesis will deal with a preliminary metallurgic examination of some of the slag that was uncovered during excavations at both the smithy and the southwest corner of Area C some forty metres to the east. Since concentrations of slag were located at two different areas, it is possible that the slag either originated from the same smithy or is related to another blacksmith shop that was operating in the area. The analysis established that since the two samples were similar metallurgically, it is likely that the two groups of slag originated from the blacksmith shop excavated at Area B.

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Chapter One

Introduction

1.1 Introduction

The study of seventeenth-century Newfoundland through the analysis of archaeological data still remains a relatively new endeavour. However, recent excavations carried out at Ferryland have uncovered a large amount of seventeenth-century material in association with a number of architectural features. One significant feature excavated was the remains of a blacksmith shop. A forge of stone construction, measuring approximately four by six feet (1.2 by 1.8 metres), was excavated along with an immense amount of iron and slag (Tuck and Robbins 1985: 240). Analysis of the artifacts indicates that it was in use sometime before the mid-seventeenth century. Consequently, it is possible that this forge may be the one referred to by Captain Wynne, when on July 28, 1622 he wrote "the forge hath been finished this five weeks" (Cell 1982: 196).

The archaeological study of blacksmith shops is very significant since it can reveal a substantial amount of information about the society in which the craft was practised. Many trades depended upon the blacksmith's work, and smiths were considered to have a vital role in almost all aspects of village life. For example, the blacksmith manufactured and repaired most of the tools that were used by the other craftsmen of the settlement as well as making many items necessary for the community to survive. Producing and repairing items such as iron nails, axes, knives, hammers, scythes, hinges, horseshoes, hooks, and ship parts ensured that the community would continue to function properly. As a result, an examination of the Ferryland blacksmith shop should reveal a great deal about seventeenth-century colonial society.

In the early years of colonization any settlement that aspired to become a permanent outpost would have considered the construction of a forge to have been of the utmost importance (Arthur and Ritchie 1982: 22). Even though many iron tools and items could have been imported, the advantages of having an on-site smithy to manufacture and repair a variety of objects would have made everyday life considerably easier. As a result, blacksmithing was considered one of the most important trades in the seventeenth century (Watson 1968: 93).

There is considerable evidence, both documentary and archaeological, that seems to confirm the notion that iron-working was considered an integral part of colonial settlement. The list of the colonists who settled Jamestown, Virginia, in 1607 included a blacksmith named James Reed (Watson 1968: 94). Also, excavations at the French settlement of Pentagoet and the Jesuit mission of Sainte-Marie among the Huron uncovered the remains of blacksmith shops

(Faulkner 1987: 135-164; Kidd 1949: 59-61). John Guy's colony at Cupids also apparently had a forge, while a list of the early occupants of the Colony of Avalon mentions two blacksmiths named Thomas Wilson and John Prater (Tuck 1993: 301). It seems conceivable, therefore, that the people who were in charge of developing these colonies or frontier settlements considered the construction of the smithy to be one of their first priorities.

The smithy that was uncovered at Ferryland is a very significant feature, since it is likely the most complete seventeenth-century Anglo-American smithy that has yet been excavated in any colonial settlement. As a result, the information retrieved from this excavation will serve as a model for smithies in other seventeenth-century colonial settlements and will be of considerable value to historical archaeologists. By using the excavated material I hope to address a number of specific issues relating to seventeenth-century colonial blacksmithing.

1.2 Research Problems and Methodology

One of the primary objectives of this study is to determine the period during which the forge was in use. To accomplish this a number of different classes of artifacts was analysed. One of the most important discoveries in the past century relating to the field of historical archaeology is J. C. Harrington's work on the dating of clay pipe stem fragments (Harrington 1954: 9-13). By analysing all the pipe bore diameters and tallying the percentages of each size found, a date range can be assigned to the particular site or stratum in question. Fortunately, excavations at Area B produced hundreds of pipe stem fragments with a large proportion located on the floor of the smithy. This provided a large sample which allowed for the calculation of an accurate time period. Excavations at Area B also uncovered a very high number of complete pipe bowls. Starting around 1570, clay pipe bowls went through a series of stylistic changes which can be effectively used as a technique for dating (Noel Hume 1970: 302-303). The same is also true of maker's marks that have been stamped onto the foot of some of the pipe bowls (Oswald 1975: 29-89; Allan and Barber 1992: 241-244). Other types of artifacts, such as ceramics, bottle glass and jettons, were also examined in order to establish the occupation period of the smithy.

Another objective of this thesis is to determine both the interior and exterior features of the Ferryland blacksmith shop. Identifying the location of the interior features of the smithy (e.g. forge, anvil, bellows, and slack tub) involved a combination of careful archaeological excavation and artifact analysis. Similar studies have been done at smithies excavated at Pentagoet, Fort St. Joseph, and Fort Vancouver (Faulkner 1987: 135-139; Wylie 1990: 71-76; Light and Unglik 1984: 6-12; Ross, Thomas, Hibbs, and Carley 1975).

Unfortunately, the excavation did not uncover much information relating to the structural features of the smithy. Except for nails, a few small fragments of poorly-preserved wood which may or may not be related to the building, and several post molds, other structural information was practically non-existent (Tuck 1989: 297). Nevertheless, an attempt will be made to use the few data that are available to make a number of general suggestions as to how the shop may have originally looked.

A major focus of this work is to identify the role of the blacksmith(s) in the colonial environment. In the seventeenth and eighteenth centuries it was common for village blacksmiths to engage in highly diversified activities and to practice a variety of trades such as locksmithing, farriering, gunsmithing, armoring, and metalsmithing (Faulkner 1987: 135). Therefore, establishing what types of items were manufactured by the blacksmiths will involve an analysis of all the different artifacts (i.e. gunflints, gun parts, lock fragments, lead and copper, building hardware, etc.) that were excavated from the smithy.

Artifact analysis will also determine the important role that the blacksmith(s) had in terms of the other tradesmen who resided at the settlement since in most cases the smiths manufactured and repaired many of their tools. Consequently, an examination of the iron artifacts should also reveal what other trades were being carried out at Ferryland during the period that the smithy was in operation. Besides making tools, the blacksmith also manufactured and repaired items ranging from cooking utensils to building hardware. Evidence of such manufacture should help determine what role the blacksmith(s) had in the colonial society and how important they were to everyday life.

Finally, two concentrations of smithy slag that were found at different locations in the Ferryland site will be analysed metallurgically. Besides the slag associated with the smithy, concentrations were also found during excavations in the south-west corner of Area C about 40 metres east of the smithy (Tuck and Robbins 1985: 241). The presence of slag at two different locations could mean there was either more than one forge in use at Ferryland during the seventeenth century or that the two deposits of slag originated from the same forge. By using the results obtained through both the metallurgical analysis of the slag and the artifacts recovered from the two deposits, some suggestions are put forth regarding the possible origins of the slag. A similar study was done by Henry Unglik and John Light during the analysis of the Fort St. Joseph blacksmith shop (Light and Unglik 1987: 93-130).

Before answering these questions, a brief description concerning the history of seventeenth-century Ferryland and the previous archaeological excavations that have been carried out at this settlement will be conducted.

Chapter Two

Early History of Ferryland (1500-1700)

2.1 Background History

Ferryland is an outport community located on the Southern Shore of the Avalon Peninsula approximately 80km south of St. John's (Map 1). For the past 500 years this settlement has played an integral role in shaping the early history of Newfoundland. Beginning with the Beothuks and European fisherman in the sixteenth century and the early colonial ventures by George Calvert and Sir David Kirke in the seventeenth century, Ferryland has had a wide and varied past. The first mention of Ferryland can be found in Verrazano's world map of 1529 where it is referred to under its original name of Farilham, which is possibly a corruption of the Portuguese word "farelhao" meaning steep rock, reef or point (Pope 1986: 1; Tuck 1996: 21).

During the sixteenth century many European nations were involved in the lucrative cod fishery off the coast of Newfoundland. As early as 1520, both the French and the Portuguese were sending as many as 100 ships to the fishing grounds each year (Matthews 1973: 69). Although it is not certain whether this early fishery was predominately wet or dry, the shores of Ferryland would have provided an ideal location to process fish and replenish stores of water and wood.

When processing fish using the dry cure method, they were first lightly salted and then wind dried. Consequently, the cobble beaches at Ferryland would have served as an excellent location to practice this dry curing technique. Excavations undertaken at The Pool (i.e. Area B) have uncovered two layers of roughly laid cobbles which possibly served as drying platforms for fish when the natural beach became filled to capacity (Tuck 1996: 29). Even though fragments of North Devon ceramics were found in association with these cobble features, no tobacco pipe fragments were discovered. This implies that these cobble platforms were built no later than the third quarter of the sixteenth century, likely by West Country fisherman (Tuck 1996: 29). Excavations also uncovered Spanish, Portuguese, Basque and possibly Breton or Norman pottery fragments in layers below this cobble platform suggesting that Ferryland served as a major seasonal fishing station for many European countries throughout the sixteenth century.

In the early part of the sixteenth century, Ferryland was also visited by the Beothuk Indians. In the lowest cultural layers of Area B, excavations revealed numerous stone tools in association with various types of European pottery and small fragments of iron. Even though none of the iron was modified into tools such as projectile points or scrapers it is conceivable that the Beothuk were visiting Ferryland primarily to obtain iron either through trade with the European fisherman or through scavenging. Since iron was a favoured raw material for the Beothuk people, it is not surprising that they visited Ferryland for this purpose (Pastore 1992: 31).

The first quarter of the seventeenth century was a very important period for Newfoundland history since it was during this time that the first serious attempts at colonization were undertaken at such places as Cupids, Renews, Bristol's Hope and Ferryland. These permanent overseas colonies, which were primarily funded by joint stock companies, were set up to better exploit the lucrative cod fishery.

The first colonization attempt undertaken at Ferryland began in 1620 when George Calvert became the proprietor of a parcel of land between Aquaforte and Caplin Bay. The following year Calvert sent a group of twelve men including Captain Edward Wynne to Ferryland to begin work on the Colony of Avalon. In a series of letters to Calvert, Wynne mentions how he and his men built a number of structures including a 44 by 15 foot mansion house, storehouse, salt works, forge, henhouse and brewhouse (Pope 1993: 12). Wynne also provides some information as to how some of these building were constructed describing how they dug into the earth for a cellar and a kitchen room. Besides constructing a number of buildings the colonists also cut enough trees to enclose the four-acre plantation with a seven-foot high "palizado" which according to Wynne would "keep off both man and beast" (Pope 1993: 12). Recent excavations of the area surrounding The Pool have determined that the early colonists also constructed at least one stone building measuring 56' by 16'. This structure, which was built in conjunction with a massive stone waterfront, served as the colony's storehouse (Gaulton 1996: personal communication). These two very impressive structures are important in that they give us some indication as to the degree to which Calvert invested into the colony. Calvert's son Cecil later claimed that his father invested as much as £20,000 to £30,000 into the Ferryland colony. Even though this figure may be inflated, it is obvious that George Calvert did invest quite heavily in his colonial venture (Pope 1986: 18).

In 1622 Wynne stated that the colony had already grown to 32 people. In addition to people related to fishing, this early population was also made up of a skilled workforce including such tradespeople as blacksmiths, stone layers, quarryman, carpenters, tailors, and coopers (Pope 1993: 19). During these next few years the colonists became involved in agriculture and husbandry thereby expanding the colony's subsistence base (Pope 1986: 19). By 1625 the population had grown to 100 people (Pope 1986: 19).

In 1627 George Calvert, now Lord Baltimore, arrived at Ferryland. He was so impressed with the colony that the following year he brought most of his family across the Atlantic to take up permanent residence at Ferryland (Pope 1986: 20). Unfortunately for the Calverts, their first year at Ferryland turned out to be very unpleasant. First, they encountered a very hard winter which caused much sickness throughout the colony. Calvert, clearly disappointed, wrote to Charles I:

> "I haue fowned by too deare bought experience, which other men for their private interests always concealed from me that from the middest of October, to the middest of May there is a sadd face of wynter upon all this land.....my house hath beene a hospitall all this wynter, of 100 persons 50 sick at a tyme, myself being one and nine or ten of them dyed....I am determined to committ this place to fishermen that are able to encounter stormes and hard weather, and to remove myself with some 40 persons to your maiesties dominion of Virginia....." (Pope 1986: 21).

In addition to the inclement weather and sickness Calvert also had to deal with French harassment of many of the English settlements located along the coast (Pope 1986: 20). The constant threat of French attack meant that much of the coast would have needed military protection which, in turn, would have caused a serious financial drain on Calvert. To provide the required naval protection he would have had to obtain permission from the King authorizing him to collect revenue from all the fishing masters who would benefit from this protection. Unfortunately, this permission was never forthcoming (Pope 1986: 23). Another source of trouble for Calvert during his first year at Ferryland was the Rev.

Erasmus Stourton. Rev. Stourton, a Church of England clergyman, was in constant disagreement with Calvert and many of his colonists since many followed the doctrine of the Church of Rome. As a result there was much ideological friction between the two (Pope 1986: 20; Pope 1993: 25). Finally, it seems that Calvert was becoming increasing disappointed with his colony at Ferryland since he was not making any profit. During the period that Calvert was in Ferryland, the fishery was in the midst of a depression which ultimately resulted in the proprietorship becoming a commercial failure (Pope 1986: 21). With all of these inherent problems Calvert decided to leave Ferryland and set up a new colony in what is now the state of Maryland.

Even though Calvert left Newfoundland in 1629, his family retained possession of Ferryland as late as 1637. In the following year, however, the proprietorship was granted to Sir David Kirke during which time he convinced Calvert's agent Captain William Hill to relocate to the other side of the harbour (Pope 1986: 23-24). For the next 13 years Kirke continued to manage Ferryland but unlike Calvert he successfully managed to make the resident fishery work economically. To do this Kirke collected rent from resident planters for fishing rooms and collected license fees for taverns. He also collected a five percent tax from the West Country fishing masters who shipped their cargo in foreign vessels (Pope 1986: 24-25). In 1651 Kirke's overseeing of Ferryland ended when he was recalled to London by the Commonwealth for an accounting of his proprietorship (Pope 1986: 27). Even though Kirke died in a London prison in 1654, his wife and three of her sons remained at Ferryland throughout most of the remainder of the seventeenth century (Tuck 1996: 22).

During the same year that Kirke was returned to London the Council of State authorized John Treworgie and five others to take control of all of his assets. Treworgie remained at Ferryland until 1660 during which time he acted as a kind of governor to the settlement (Pope 1986: 28). Soon after Charles II's ascendency to the English throne both the Calvert and Kirke families renewed their claims to the proprietorship of Ferryland. Even though the suit was officially decided in the Calverts' favour in 1661, the Kirkes still remained at Ferryland and in doing so retained control of many of the fishing premises (Tuck 1996: 29). The latter part of the seventeenth century proved to be a very tumultuous period for the people of Ferryland. In 1673 the colony suffered a severe setback when four Dutch ships under Nicholas Boes raided the settlement. The Governor of New York, Dudley Lovelace, who was a prisoner onboard one of the ships, described this event when he wrote "the enimie plundered, ruined, fired and destroyed the commodities, cattle, household goods, and other stores" (Pope 1993: 107).

In 1696 Ferryland was sacked again, but this time by a group of French ships. A letter, written in 1697 by Ferryland resident John Clappe, described how the French burned all their houses, household goods, fish, oil, train vats, stages, boats, nets, and all their fishing craft to the value of twelve thousand pounds sterling (Pope 1993: 144). After the attack, many of the Ferryland colonists were taken prisoner and sent back to Appledore, Devon, where they resided for the winter (Pope 1986: 31). In the years following the French raid, many colonists resettled at Ferryland. This resulted in the main focus of settlement changing from the original site of the colony to other parts of the harbour (Tuck 1996: 23).

This chapter offers only a brief description of the background history of Ferryland. For a more detailed study concerning the political, economic, and social history of this area one should refer to Dr. Peter Pope's M.A. thesis "Ceramics From Seventeenth-Century Newfoundland" and his PhD dissertation "The South Avalon Planters, 1630 to 1700: Residence, Labour, Demand and Exchange in Seventeenth-Century Newfoundland". Also available for study is a collection of over 200 pages of primary documentation compiled by Dr. Pope dealing predominately with Ferryland between 1597 and 1726.

Unfortunately primary documentation by itself is unable to answer many important questions concerning seventeenth-century Ferryland, including those that deal with the lifestyle of the average person. Since most documentation is concerned either with significant events and/or important people most histories tend to exclude the majority of the population and their role in everyday life. However, when one uses historical documentation in conjunction with archaeology there is a greater chance of illuminating the lives of the illiterate and the ignored (Pope 1986: 33). Consequently, this research will focus on a seventeenth-century blacksmith shop that was discovered at Ferryland and the important role that it would have played in the colonial settlement.

Chapter Three

History of Excavation

3.1 Archaeological Excavations at Ferryland

For over the past 100 hundred years, amateur archaeologists, historians, and professional archaeologists have all attempted to uncover evidence of the early Colony of Avalon at Ferryland. The first reported excavation was carried out in 1880 by Bishop Michael F. Howley. Bishop Howley, in his book "*Ecclesiastical History of Newfoundland*", mentioned that even though very little remains of the original colony, the foundations of Lord Baltimore's house were still visible (Howley 1979: 124). Unfortunately, the exact location of his excavation still remains unknown (Pope 1989: 78). He also reported that excavations uncovered a number of artifacts including a silver snuff spoon. Interestingly, this spoon had the initials G.K. inscribed unto it which led Bishop Howley to believe that it originally belonged to George Kirke, one of the sons of David and Sarah Kirke (Howley 1979: 124). In 1937, Dr. Stanley Brooks conducted further excavations around The Pool and on the adjacent mainland west of the site. In a brief unpublished report and subsequent newspaper article Dr. Brooks suggested that the Mansion House was located somewhere near the former St. Josephs school or what is now the Colony of Avalon visitor center (Brooks 1937: 1; Pope 1986: 77-78). Brooks bases this idea on a letter written in

1622 by Ferryland colonist Daniel Powell in which he describes the location of the mansion house "at the foot of an easie ascending hill" (Pope 1993: 15). According to Brooks the hill Powell was referring to was The Gaze, a hill situated to the west of the settlement. Brooks also claims to have located a depression in the same area that had measurements very close to the dimensions of the Mansion house given by Wynne (Barakat 1976: 16).

In 1959, J.R. Harper of the Historic Sites and Monuments Board of Canada began an excavation in the Ferryland Pool area. During the course of the excavation, Harper dug a six by six foot test square in an abandoned garden somewhere near the present location of Area B (Harper 1960: 111). Harper stated that the recovered artifacts show evidence of occupation at this site from the first quarter of the seventeenth century up to the nineteenth century. He also suggested that artifacts from the lowest level of the test square, which date from about 1625-1650, represent objects located in "a wing or outbuilding of the main Baltimore house just to the west" (Harper 1960: 111; Pope 1986: 78).

Dr. James Tuck of Memorial University conducted an excavation at the Ferryland Pool area in 1968 in the present location of the salt beef plant. During this excavation Dr. Tuck and his crew discovered a slate drain and a quantity of seventeenth-century artifacts (Tuck 1996: 24).

In 1976, R.K. Barakat of Memorial University carried out a series of excavations to the east of Harper's test square and on Bouys Island, which is located just north of Ferryland Head (Tuck 1996: 24; Pope 1986: 80). According to Pope, the artifacts that were recovered date primarily to the eighteenth century (Pope 1986: 80).

In 1984, 1991, and 1992, the Ferryland Pool area was also the subject of underwater archaeological work. In 1984 Skanes and Deichmann carried out an underwater survey of the north shore of The Pool along with an analysis of artifacts that were recovered from fill that was previously dredged from the same location (Skanes and Deichmann 1984: 398). Both the underwater survey and the analysis of the artifacts excavated from The Pool fill showed evidence of the Ferryland Harbour having been used by Europeans during most of the historic period (Skanes and Deichmann 1984: 401). Even though Skanes carried out more underwater surveys in 1991 and 1992, results of this work are unavailable.

In 1989, M.A. Stopp did some salvage work at the beginning of the Lighthouse road just to the west of the Williams property. Excavation of a four by one meter trench uncovered a number of artifacts ranging in date from the seventeenth to the twentieth century. Two identifiable features in the form of a cobblestone road and the remains of a stone wall were also uncovered in this trench (Stopp 1989: iii). Beginning in 1984, a crew from M.U.N., under the direction of Dr. James Tuck, started an intensive archaeological program in The Pool area to assess the potential of the site, the degree of disturbance caused by recent construction, and to hopefully find some physical remains of the Colony of Avalon (Tuck 1993: 296). During the next 12 years (it should be noted that excavations were delayed from 1987 to 1991) seven different areas were excavated (Areas A-G) uncovering no less than nine different structures and an immense amount of seventeenth-century material (Map 2)(Plate 1). In the following sections each of these particular sites will be described in detail.

Area A

It was during the first field season that two locations, Areas A and B, were excavated. Area A consisted of four excavated one meter squares at the western margin of the site in which some seventeenth-century material, but no features, were found (Tuck 1993: 297; Tuck 1996: 27).

Area B

During the 1984 and 1985 field seasons excavations at Area B uncovered the remains of a stone forge and a vast number of seventeenth-century artifacts including material associated with blacksmithing such as slag, iron, charcoal, coal, and copper. In total about sixty square meters were excavated, although not all were taken down to the sterile subsoil (Pope 1986: 83). It was not until the 1994 field season that work was continued at Area B, during which time the blacksmith shop was completely excavated. These excavations revealed the floor of the smithy plus an enormous number of artifacts.

Late into the 1994 field season and throughout the 1995 season excavations of the original sand and gravel beach at the lowest levels of Area B uncovered a number of small hearths of fire-shattered rock and a quantity of stone tools. These stone tools, which included small projectile points, bifaces, and a chopper were all made from regionally available chert. Tuck states that the small projectile points are almost identical to those found on Beothuk sites excavated in other areas of Newfoundland such as Boyd's Cove and Russell's Point (Tuck 1996: 27). In addition to these stone tools pieces of burned bone, seeds, fir needles and hundreds of chert flakes were also uncovered.

At roughly the same level in which the Beothuk material was located, excavations also uncovered evidence pointing to an early European presence at Ferryland. This evidence, which is in the form of well preserved ceramic fragments, have been identified as having either a Portuguese and/or Spanish origin, while other pieces were identical to those recovered from excavations at the sixteenth century Basque whaling station at Red Bay, Labrador (Tuck 1996:

28). Also, another type of ceramic, which is of a form yet unidentified, might be of Norman or Breton origin (Tuck 1996: 28). What is important about these ceramics is that they provide valuable information pertaining to the nationality of the Europeans who were involved in the Newfoundland cod fishery during the sixteenth century. Even though archaeology has ascertained that both Europeans and Beothuks frequented Ferryland during the sixteenth century it is unknown whether the two peoples came into contact with one another and, if so, what the nature of these encounters might have been.

During the latter part of the 1995 field season, excavations also uncovered a portion of a cobblestone road and the foundation and fireplace of a domestic residence. The exposed portion of the cobblestone street measured approximately 30 metres in length and four metres in width (98' by 13') and may represent the original street that Captain Wynne is supposed to have built in 1622. A brief examination of the excavated house seem to suggest that it was a wood frame structure built upon a stone wall foundation (Tuck 1996: 31).

Area C

In 1986 excavations were also undertaken at Area C, approximately 40 meters northeast of Area B. These excavations uncovered evidence of a stone structure and thousands of seventeenth-century artifacts. After this 1986 field season it became apparent that the Ferryland site was so rich in artifacts that future excavations would have to be delayed until conservation capabilities could be increased (Tuck 1989: 303). In 1992, archaeological work was initiated once again with excavations concentrated at Area C. Over the next five years, excavations at Area C revealed at least two different stone buildings, a stone privy, and a massive seawall structure along with an enormous number of seventeenth-century artifacts.

The only complete building that was fully exposed at Area C was a large stone structure with an interior space measuring approximately 56' by 16' (Gaulton 1996: personal communication). This building, which contained artifacts dating to the first half of the seventeenth century, likely served as the colonists' storehouse. Excavation of this storehouse have determined that this structure was roofed completely in stone slates. Incorporated into this building on its north side was a massive stone wall. This stone wall, which has a single finished face only on its north side, likely served as a seawall that formed a quayside along the southern edge of The Pool. Recent excavations have shown that this seawall continues westward along the inner perimeter of The Pool for approximately another 50 metres and turns to the north at the eastern end of The Pool (Tuck 1996: 32).

In the western section of the storehouse excavations uncovered a stone-lined privy. This privy, which measures four by nine feet and four feet deep, was built directly into the seawall. This structure had two drains located below the high tide level which allowed the privy to be flushed out every twelve hours (Tuck 1996: 33). Since the soil found in the privy was water-saturated, a variety of organic materials such as a wooden wheelbarrow, various textiles, leather shoes and scabbard, plus a vast number of fish, mammal, and bird bones and seeds were discovered (Tuck 1996: 34). Parasitologist Patrick Horne analysed some of the privy refuse and identified the eggs from a number of different human intestinal parasites (Tuck 1996: 34). One interesting artifact that was discovered in the privy was a small wax seal that bears the Immaculate Heart of Mary situated below a weeping eye. This image, almost certainly Roman Catholic, most likely arrived at Ferryland during the 1620s when many of the settlers were practising Roman Catholics (Tuck 1996: 34).

A second structure that was uncovered at Area C was a portion of a stone cowhouse or byre. This byre, which seems to have been constructed sometime after 1673, was built using the east-west wall of the storehouse. It was floored in cobblestones that were laid in such a way as to form a drain that proceeded through the west wall of the building. This drain continues westward until it eventually ends up into the now converted privy or cesspit (Tuck 1996: 35). This drain would have permitted animal waste to flow from the floor of the cowhouse to the cesspit and from there out into the ocean.

For a more detailed discussion of Area C and its associated structures refer to Barry Gaulton's M.A. thesis "Seventeenth-Century Stone Construction at Ferryland Newfoundland (Area C)".

Area D

In 1994 excavations were also begun at Area D during which time both a domestic building and a stone-lined well were discovered. This building had overall measurements of approximately 17'6" by 39' including a large stone fireplace located at one of its gabled ends. This house was constructed almost entirely from wood, since excavations uncovered a layer of wood charcoal consisting primarily of preserved beams and planks. Analysis of the associated artifacts reveals that even though this building was substantial in size, the owners of this house were not, in all likelihood, of the gentry class. This idea is suggested by the ceramics since a high proportion of those found in the house were of the low-end variety (i.e. relatively expensive wares such as tin-glazed and sgraffito pottery were not discovered in any significant quantity). This point is reinforced in that no glassware or other similar artifacts were found (Tuck 1996: 36). Artifact analysis (i.e. pipestems, pipebowls and coins) suggests that this house was constructed no earlier than the mid-seventeenth century and likely destroyed by the French attack on Ferryland in 1696 (Tuck 1996: 36).

Excavations very close to the house also uncovered the remains of a stone-lined well. This well, which extends approximately 25' below the ground surface, was constructed using a combination of timber, brick and stone. Even though no dateable artifacts were found within the well, excavations in close proximity to it did find some that relate to the seventeenth century. As a result it is probable that the well was associated with the house.

Area E

During the 1993 field season excavations were undertaken on the hill at the southern edge of the site. Since this location provided an excellent view of the harbour it was not surprising to have discovered the remnants of early fortifications in this area. During the late seventeenth century, Captain William Holman was reported to have repaired the colony's fortifications. Consequently, it is possible that some of the structures discovered at this location, such as the retaining wall, mound, and gate, are somehow related to Holman's Fort. Excavation of a one metre trench revealed a sod structure that Tuck states may have been a part of the colony's original fortifications. This structure, which likely functioned as a gun platform, was built directly upon a sterile humus layer, and for that reason may be related to the fortifications erected at Ferryland during the early years of the colony (Tuck 1996: 39-40). Excavations in the upper levels of Area E revealed a building having two gable-ended fireplaces. This building, which measured 12 by 30 feet, contained a high proportion of drinking vessels, glass, and pipe fragments suggesting that this structure once served as a tavern or tippling house. Analysis of the recovered artifacts indicate that this building was used during the first half of the eighteenth century (Tuck 1996: 39).

Area F

In the summer of 1996, excavations began at a location directly across from Area C in the former property of Mr. Arch Williams. Even though excavations at this area are presently ongoing, it is possible to make a number of general statements concerning some of the material that has been uncovered to date. Very early in the dig season excavations in the northern section of Area F discovered a layer of cobblestones about 90cm below the surface. Although the excavation of this cobblestone level has not been completed, enough has been uncovered to determine that its maximum width was approximately 13 feet and that it does not continue on in an eastward direction. This measurement is almost exactly the same as the width of the cobblestone street found in Area B in 1995. This, coupled with the fact that both layers of cobblestones were laid in a very similar fashion, suggests that the two are almost certainly associated with each other. In a 1622 letter to George Calvert, Captain Edward Wynne writes "...for the comfort of neighbourhood, another row of buildings may be so pitched, that the whole may be made a pretty street" (Pope 1996: 11). This comment suggests that one row of buildings had already been constructed and that when the colonists finished construction on buildings located across from these they would have made a street. Consequently, if the cobblestone road that we have located in both Areas B and F is the same as the cobble street mentioned by Wynne it is possible that we have discovered both the eastern and western margins of the colony of Avalon. This will prove to be very helpful in locating more buildings associated with the original colony.

Excavations to the east of the cobblestone road have uncovered a thick layer consisting of burned charcoal and brick. Associated with this destruction layer is an immense number of late seventeenth-century artifacts including such items as pipe fragments, glass, various metals, and ceramics. Located immediately below this destruction level is a dark layer containing artifacts dating primarily to the first half of the seventeenth century. Future excavations in this location may reveal some structure related to the original Colony of Avalon. Excavations carried out at the western margin of Area F have also turned up a high quantity of artifacts dating to the first half of the seventeenth century.

Area G

Midway through the 1996 field season excavations were started to the west of Area C in a vacant lot owned by Mr. Ray Costello. Excavations at this area included a one by nine metre north-south trench along with a east-west trench running parallel to the high tide mark. In this first trench a cobblestone feature and artifacts dating primarily to the late seventeenth century to the early eighteenth century were discovered. Analysis of these artifacts and the depth of the deposit seem to suggest that this feature is related to a cobblestone paving previously discovered at the western margin of Area C in 1995-1996. Due to the later construction date of this cobblestone feature it is very likely unrelated to the sections of cobblestone road found in Areas B and F (Tuck 1996: personal communication).

During the 1996 field season excavations were carried out in three different locations parallel to the high tide mark and in line with the seawall found at Area C to determine the extent of the colony's early quayside. Consequently, three of the excavated test pits uncovered preserved segments of the seawall. Adjoined to the seawall in two of the pits were horizontal logs attached to vertical wooden posts. These possibly served as strouders, which allowed ships or boats to moor against the seawall without sustaining damage.

A rich deposit of eighteenth-century material was unearthed above and to the south of the seawall. These artifacts, which included saltglazed stoneware, creamware, window glass, and pipe fragments seem to suggest that a domestic structure dating to around the third quarter of the eighteenth century is located nearby. Excavations at both Areas F and G will continue during the 1997 field season. Further archaeological examination will undoubtedly provide us with more information concerning the features that have been found at these areas while also giving us a greater understanding of the Colony of Avalon.

Chapter Four

Construction of the Blacksmith Shop

4.1 Introduction

When Captain Edward Wynne and his eleven labourers first arrived at Ferryland in 1621 one of their immediate tasks were to reclaim previously "void or waste ground" (Pope 1993: 13). By using the soil that was dug during the initial construction of a well, brewhouse, kitchen and tenements, and depositing it next to the shoreline, Wynne and his men were able to generate new land which could be used to develop the colony (Pope 1993: 13). It seems that this method of creating new land became common practice as the labourers expanded the boundaries of the colony. Consequently, when excavations began at the site of the smithy, it was observed that this method was employed during its initial construction phase. Excavations have determined that the blacksmith shop was constructed directly into the side of an "easy-ascending" hill that flanks much of the area around The Pool. It was done in such a way that the walls of the shop (excluding the front portion) would have been positioned directly up against subsoil walls. By digging out a section of the hill measuring approximately 3.5m by 5.25m (11'5" x 17'2") and transferring the excavated soil next to the shoreline the colonists would have created two building areas that were previously unavailable. Even though this method of reclaiming land would have undoubtedly been very strenuous work, it was, however, a very resourceful way of exploiting land that was previously unusable in order to produce new property on which further buildings could be constructed.

4.2 Exterior Features of the Blacksmith Shop

Unfortunately, excavation of the smithy revealed very little evidence pertaining to its structural characteristics. Besides nails, roof slates, a few small fragments of poorly-preserved wood (which may or may not be related to the building) and several post molds, other structural information was practically non-existent (Tuck 1989: 297). Nevertheless, enough artifactual evidence was uncovered to make a number of general suggestions as to what the shop may have looked like.

During the course of the archaeological project it became apparent that the smithy was built without the use of either a brick or rock sill. Consequently, it seems that the walls of the blacksmith shop were constructed by placing upright boards directly into or on the ground in such a manner that they would have been situated adjacent to the subsoil retaining walls. Evidence that pointed to this type of construction was in the form of a three to four inch wide space that existed along the outer perimeter of the floor (with the exception of the front section). This "space" was easily discernable, considering that most of the floor was covered with a very hard packed layer of clay, slag, scale, coal, and charcoal which was practically impenetrable. This is the only structure excavated in The Pool area that displays evidence of this type of construction. This particular building design, which was quicker and easier than the construction techniques found in the other excavated buildings would have most certainly decreased the amount of time it would have taken to get the smithy operational. Since the blacksmith shop would have ultimately produced many of the items needed for building other structures, it was probably the intention of Wynne and his labourers to construct the smithy as quickly as possible. This would have resulted in the structure having been built in a simple basic form.

As previously mentioned, the front section of the smithy did not have this three to four inch wide trench. Since the front wall was not constructed in the same manner as the other three, what type of front was on this building? It is possible that this structure was open on the front end, similar to other smithies of the same period (Tuck 1989: 297). Another possibility is that the front section was comprised of two large doors that would have been supported by corner posts. These types of doors were commonly found in shops operated by smiths who practised farriering. This would have made the job of shoeing horses and/or oxen much easier, since the smith could bring the animals directly into the shop.

Other information related to the structural characteristics of the forge are related to both the roof and floor. We can be relatively certain that the original floor of the smithy was made of dirt. However, over its many years of use, most of the floor became encrusted with coal, charcoal, slag, scale, and many fragments of pipes, ceramics, and chert. Excavation of the floor also uncovered a number of small post molds that could be related to interior bracing (Tuck 1989: 297). A substantial number of roof slates, most incomplete, indicate that the blacksmith shop was roofed in this material. Barry Gaulton, who is studying various stone building techniques employed at Ferryland, suggests that the shape of these slates is very similar to the those used to cover the storehouse located at Area C (Plate 4.2).

From all of the above evidence it can be determined that unlike most of the other buildings excavated at Ferryland, the blacksmith shop seems to have been a structure that was constructed in a relatively rough unfinished manner.

4.3 Interior Layout of the Blacksmith Shop

Blacksmith shops, whether large or small, should contain four clearly identifiable sections; the work area, domestic area, storage area, and the refuse area (Light 1984: 55). Even though these areas may overlap and vary in size, complexity and spatial relationships, all should be discernable through careful archaeological excavation and artifact analysis (Light and Unglik 1984: 11). Fortunately, the Ferryland smithy was found to be in a remarkable state of preservation, which made the process of determining the various components of the blacksmith shop very straightforward.

Determining the work area(s) of any smithy involves establishing the location of such items as the forge, anvil, bellows, workbench, slack tub, and blacksmith tools. The stone forge (Feature 26), which measures approximately four by six feet (1.2 by 1.8 metres), was located along the west wall of the smithy in such a way that one end was set into it (Plate 4.3). Even though the forge was not fully intact, some sections measured up to 50cm in height. It is likely that it was originally higher than this, since a few quarried stones belonging to the forge were found scattered around the structure. Also, no hole for the tuyere pipe was detected among the dry masonry structure suggesting that it was probably lost when the upper stone courses of the forge were dismantled. It is difficult to ascertain the exact height of the forge since this would have ultimately depended upon the personal preference of the blacksmith. In most cases, however, the blacksmith's forge would have been built waist high since this would minimize work effort (Light 1984: 56). Excavations also found many fragments of brick along the upper surface of the forge suggesting that the upper courses could have been made from that material (Tuck 1989: 297).

Another interesting feature of this stone forge is its shape. Located at the easternmost section was an almost square alcove that measured approximately 72cm by 68cm. This alcove, which has a slate floor, was built directly into the stone forge. At first this feature was very puzzling since no documentary sources mentioned any similar type of anomaly. However, when one considers how smithy work areas are organized it becomes apparent that this space was likely reserved for the slack tub. The layout of the work area depended almost solely upon the location of the forge, since other features like the anvil, slack tub, and bellows would have been located in close proximity to it. This was done to minimize unnecessary movement and allow the blacksmith to conserve as much energy as possible. Therefore, in relation to the forge this would have made an excellent area to place the quenching tub. Slack or quenching tubs were very simple items, usually consisting of a half barrel (Light 1984: 57). Considering the size of the alcove a half barrel tub would have fit almost perfectly.

Located approximately 50cm and 100cm northeast of the forge are two large post molds (Features 28 and 29) surrounded by a thick concentration of scale and small iron fragments (Features 27 and 31). These post molds almost surely indicate the location of the anvil (Plate 4.4). As previously mentioned, the anvil would have been located next to the forge to maximize efficiency and allow the smith to work the iron while it was still hot (Light 1984: 57). These two post molds suggests that the location of the anvil was relocated sometime during which the forge was in use (Tuck 1993: 300).

Excavations south of the stone forge unearthed two post molds (Features 78 and 79) that likely represent the posts that once supported the bellows (Plate 4.5). The bellows, which had to be mounted off the floor to prevent the leather from rotting and allow for air intake, would have been supported by either one or two posts (Light 1984: 56). Since neither the hole for the tuyere pipe or any physical remains of the bellows were discovered, these post molds provide the only evidence for the probable location of the bellows.

Excavations of the smithy floor approximately 25cm north of the stone forge revealed another large post mold which possibly represents the location of the block that would have supported the blacksmith's swage (Feature 37). A swage is a large item that is not used as often as other blacksmith tools therefore it is usually located in a less busy section of the smithy (Light and Unglik 1984: 10). The blacksmith(s) may have also possessed a mandril which would have likely been located near the swage.

The only feature in the work area that could not be identified archaeologically was the position of the blacksmith's workbench. Since no soil samples were taken from the forge floor during excavations, soil analysis to help determine workbench placement could not be carried out. This type of study was done by Parks Canada archaeologists when excavating the Fort St. Joseph blacksmith shop in Ontario (Stewart, Light, Lafleche 1984: 40). However, by examining the location of the other features in the work area the possible positions of the workbench become more apparent. Space limitations at both the southern and eastern sections of the blacksmith shop, due to the location of the bellows, fuel pile, and anvil, make the placement of the workbench in these areas very unlikely. Consequently, the most probable place for the bench would be either against the northern half of the west wall or directly against the north wall. Further evidence that supports this is that many of the blacksmith'7s tools, such as two files, a hand vise and one set of bench shears, were unearthed in the front section of the smithy adjacent to both the north and west walls. These items were commonly used in conjunction with a bench vise which would have been attached to a workbench. Therefore, since these tools were all discovered together, it is probable that the workbench would have been stationed nearby.

In many cases the workbench would have been situated very close to a window, allowing for good lighting while the smith worked at the vise (Light 1984: 59). When one studies the layout of the Ferryland smithy it becomes clear that the north wall and/or the northern half of the west and east walls are the only areas that could have contained windows, since the other wall areas were put up directly against the subsoil embankment. Unfortunately, however, no window glass was recovered during the excavations so this idea of window placement is highly speculative.

A blacksmith would commonly organise his smithy in such a way as to have places for unused iron stock, reusable scrap, and for fuel (Wylie 1990: 73). The location of these storage areas depended upon the availability of space within the shop and upon the preferences of the blacksmith. In the southeast section of the smithy a large concentration of both coal and charcoal was discovered suggesting the probable location of the fuel pile (Feature 36). Light states that it was common practice for many smiths to place their fuel piles outside of the smithy to prevent spontaneous or accidental combustion (Light and Unglik 1984: 6). In this case, however, the fuel pile was located in relatively close proximity to the forge. The fact that both coal and charcoal were found suggests that both were being used as fuel (Plate 4.6). Faulkner suggests that coal-fired forges were uncommon in the seventeenth century even though the smithy that was excavated at Fort Pentagoet also used coal as its fuel (Faulkner 1987: 137). Charcoal, on the other hand, was the most common type of fuel mainly because it was much cleaner than coal and did not have to be imported (Faulkner 1987: 137). Why were both coal and charcoal being used at the Ferryland smithy? It is possible that coal was the desired fuel but when its stores became depleted the smith(s) switched to the readily available source of wood to make charcoal. Even though coal may contain sulfur which may cause the iron to become brittle and hard to work it does allow for very high temperatures. This would be very beneficial to the smith when carrying out such operations as forge welding (Faulkner 1987: 137-138).

It was common practice for blacksmiths to store iron bars and rods along walls, under the bellows or workbench, or outside in an adjacent shed (Wylie 1990: 73). However, whether or not these locations were used by the blacksmith(s) who operated at the Ferryland smithy is difficult to determine. Since this smithy was likely abandoned rather then destroyed, many of the storage areas would be virtually barren of iron stock and other reusable scrap, since it would have been salvaged for later use (Light 1984: 60). Excavations did uncover a number of stock fragments and pieces of reusable scrap. The highest concentrations were found to exist around the anvil post holes. However, since other fragments of iron scrap were scattered throughout the smithy no storage areas could be positively identified.

Another area that could exist both in and around the blacksmith shop is the refuse area. Forge clinker, which is a combination of slag, fuel residue and material from the forge and fire base, was found in a number of locations (Light

1984: 61). Determining the various refuse areas involved plotting each piece of forge clinker in the square from which it was excavated. Percentages then revealed which areas had the higher concentrations of slag (Figure 4.5). In performing this task all slag that was excavated north of the N5 line was omitted since it all came from a disturbed context. The highest concentration of forge clinker was found at the northeast section of the forge. It is likely that this clinker was piled up against the north wall of the smithy but ended up in its present location when this wall decayed. When the four grid squares of E2 S1, E1 S1, E2 N0, E1 N0 are compiled as one unit, the total percentage of clinker in this area in relation to the rest of the site comes to 73.0%. With such a high percentage it is reasonable to assume that this was the refuse area of the smithy. Along with forge clinker many other artifacts were uncovered in this refuse pile such as scrap iron and copper, plus other items such as glass, pipe, and ceramic fragments (Figure 4.6, 4.7, 4.8, and 4.9). It is interesting to note that both anvil post molds turned up relatively high percentages of forge clinker. It is possible that this clinker was related to that found in the refuse pile situated just to the north.

Excavations at the back of the shop near the location of the bellows post molds uncovered a vast amount of material such as case bottle glass, broken pipes and ceramic fragments (Figure 4.7, 4.8 and 4.9). As was done with the forge clinker each class of artifacts (i.e. pipes, ceramics, and glass) was plotted and percentages per square tabulated. In all cases the highest concentrations of artifacts were located in the southwest section of the forge. It is therefore reasonable to assume that this was another refuse dump. Another explanation that could explain why such a high proportion of artifacts was situated in this area is that these items would have been situated under the bellows. Consequently, it is possible that the smith(s) never swept this area thereby allowing these materials to built up over a period of time.

Along with being a place of work, the blacksmith shop in many instances was also the social centre of the community (Light 1984: 60). While the smith(s) carried out his work the patrons had time for talk, argument, political debate, gossip, and ridicule (Watson 1968: 95). Since the blacksmith shop offered warmth and a place where both friends and patrons could wait for the smith to fix or manufacture a number of commodities meant that items associated with social activities should turn up in high quantities. Therefore all blacksmith shops should contain a social area where the smith, friends, and clients could relax, eat and drink (Light and Unglik 1984: 12). To assist in determining the position of the domestic area(s) of the smithy, I again referred to the distribution maps of artifacts such as bottle glass, pipes and ceramics (Figure 4.7, 4.8 and 4.9). The squares that turned up the highest artifact percentages were located in the southwest section of the smithy (W2 S4, W1 S4, W2 S5, and W1 S5).

Concentrations of artifacts were so high in these squares that it seemed a likely socializing area for the shop. However, this was the likely position of the bellows and the high concentration of artifacts could have resulted from the smith(s) not maintaining this location as much as busier sections of the shop thereby allowing refuse to build up over long periods of time. Another section of the shop that had relatively high percentages of artifacts was the area north of the forge. However, overall percentages were not varied enough to be able to state confidently that any particular area(s) of the shop could be designated as having a domestic and/or social function. Therefore, it can be assumed that the social area(s) would have overlapped with the other functional areas of the blacksmith shop.

Chapter Five

Chronology and Artifact Models

5.1 Dating the Forge

Determining the duration of the smithy, from the time of its initial construction to its eventual abandonment, involved the analysis of both historical documentation and various classes of artifacts such as clay pipes, ceramics, and glass. Through careful investigation it will be shown that this blacksmith shop was built in 1622 and continued to be in use until approximately 1650. Evidence that establishes the date of forge construction is a letter written July 28, 1622, to George Calvert. In this letter Captain Edward Wynne states "the forge hath been finished this five weeks", suggesting that the smithy was built in the latter part of June, 1622 (Pope 1993: 12). Although this information gives us a definite date for the time of construction, it is useless until we prove that the forge mentioned by Wynne is actually the same as the one excavated. An examination of the artifacts will determine that the forge excavated in the Ferryland Pool area was the same forge mentioned by Captain Wynne.

5.2 Clay Pipe Analysis

One of the most valuable artifacts used in dating historic sites is the English kaolin tobacco pipe. Beginning in the latter part of the sixteenth century and continuing up until the nineteenth century, the size and shape of clay pipe bowls underwent an easily recognizable evolution (Noel Hume 1969: 296). J.C. Harrington has also shown that clay pipe stem fragments, which survive in larger quantities than the bowls, have undergone a regular and nearly linear decrease in bore diameters over the period of 1600 to 1750 (Harrington 1978: 63-65). Since clay pipes were very fragile (i.e. usually having a lifespan of less than a year or two) and relatively inexpensive to purchase, pipe fragments almost always turn up in high quantities. As a result, archaeologists working on historic sites find these particular items very useful for dating.

Similar to excavations at the smithy/barracks at Pentagoet, pipe fragments at the Ferryland smithy were found in high concentrations directly around the forge (Faulkner 1987: 62). On many areas of the smithy floor there existed a deep ferrous deposit in which hundreds of clay tobacco pipe fragments were excavated (Pope 1988: 8). In this forge floor level (event 154) more than 748 pipe stem fragments and 98 complete pipe bowls were recovered. Such a large sample of pipe fragments proved to be very useful in determining the development and occupation period of the blacksmith shop.

5.2.1 Statistical Dating of Pipe Stem Fragments

The J.C. Harrington dating method was used because of the large number of pipe stem fragments that were recovered from the floor of the smithy. This method, which is based on the premise that stem bore diameters steadily decrease from 1620 to 1800, is calculated by fitting each fragment over different sized drill bits (graduated in 64ths of an inch) and tabulating the number of each size (Harrington 1978: 64). When the results are put into chart form one can see the possible range of occupation for the site in question. In 1961, Binford refined Harrington's idea and expressed the relationship between the date and stem bore diameter as a straight line regression formula. This made it possible to calculate a mean date regardless of the size of the sample (Binford 1962: 19-21). It is important to remember, however, that this does not necessarily mean that the results calculated from a small sample are meaningful. Also, some archaeologists have suggested that Binford's dating method may be unreliable when utilised with pipe samples originating from seventeenth-century contexts (Hanson 1961: 2-15). Consequently, Binford's dating formula was used in this thesis simply as a method to determine the relationship between a number of particular levels rather than to establish specific dates.

Before the data are presented, some important points regarding the validity of the dates should be discussed. During the process of measuring the pipe stems, it became apparent that distinguishing fragments of either English or Dutch manufacture was impossible. Since both Harrington's and Binford's dating methods were based on English clay tobacco pipes, any Dutch stems that were in the sample could possibly alter the results. Fortunately, however, an analysis of the pipe bowls/fragments determined that only 8% were possibly of Dutch manufacture. Therefore, the inclusion of a small number of Dutch pipes in the sample should only slightly modify the results. A second factor which could bias the results is the blacksmith and shop maintenance. If the smith frequently swept up the shop many of the pipes representing the earlier periods of occupation would have been discarded. This would mean that many of the pipes recovered during the excavation likely represent the last period of forge occupation. Finally, one must realise that many of the pipes that ended up on the floor of the smithy would have been continuously walked upon and therefore broken into many unrecognizable fragments. This would undoubtedly skew the dates obtained through the pipe analysis so that they are more representative of the later stages of the forge occupation.

Analysis of the pipe stems excavated from the forge demonstrated that the blacksmith shop was in operation from about 1620-1660. This is suggested by the pipe stems recovered from both event 154 and stratum 2B. Event 154, which is comprised of artifacts excavated from the forge floor, exhibited an occupation date range from 1620-1660 (Table 5.1). As mentioned earlier, it is possible that this date range is more representative of the last period during which the forge was in use. To help determine the period when the forge was abandoned, pipe fragments excavated from stratum 2B were also analysed. This stratum, which was found over the whole site, consisted of a fill layer that was deposited sometime after the forge fell into a state of disuse. It now seems that this layer is associated with a domestic structure (which dates to the second half of the seventeenth century) that was discovered just north of the smithy. The Harrington chart displays a period of occupation ranging from about 1650-1680 (Table 5.6). This is very important because it suggests that the forge fell into disuse sometime around the mid-seventeenth century.

Even though more events were found during the excavation of the blacksmith shop, it was realised that most did not contain enough pipes to make their anlaysis statistically relevant. Level 2C was situated immediately above Feature 31 and possibly represents the time of abandonment and initial filling of the smithy (Pope 1986: 88). Other events that were excavated included a thin organic level that was revealed in a limited area south of the forge (S3 W3 and S3 W4) referred to as 3A. This event possibly represents the decayed walls and/or roof of the blacksmith shop (Pope 1986: 89). It is likely that this level is related to level 2C and represents the time of abandonment of the blacksmith shop. Another level that was excavated was stratum 3C. This level was located below event 154 and was only found in one square. It is possible that this level represents the earliest occupation of the smithy (Pope 1986: 90). Other levels that were associated with the smithy were events 136 and 163. Event 136 was comprised of a dark brown soil that contained such items as charcoal, ash, iron, and pipe fragments. Event 163 constituted artifacts that were recovered from the stone forge. Since the number of pipes from these levels and events were minimal it was decided that they would not be used as a basis for dating the forge, but only for comparison purposes. However, it should be mentioned that the data concerning these levels (i.e. level 2C, 3A, 3C, event 136, and 163) is included in the tables located at the back of this thesis.

Statistical analysis of the pipe stem fragments suggests that the forge was in use from the period of 1620 to 1660. However, through the analysis of pipe bowls, ceramics and glass it will be demonstrated that the blacksmith shop ceased to be used around the late 1640s or early 1650s rather than the later date established by the pipe bore sizes.

5.2.2 Clay Pipe Bowl Analysis

Over the last forty years much emphasis has been placed on analysing the differences in both size and shape of clay pipe bowls dating from the late sixteenth century up to the nineteenth century. Prior to Harrington's method of dating pipe stems the analysis of clay pipes centered almost completely on the evolution of the bowl form which, according to Noel Hume, is still the most reliable method for dating seventeenth-century sites (Noel Hume 1969: 302). Fortunately, many of the pipe bowls that were excavated from the Ferryland smithy have been previously analysed by Peter Pope of Memorial University of Newfoundland (Pope 1988; Pope 1994). During his research on pipe bowls excavated from Area B, Pope identified 19 different clay pipe bowl types. These types were then compared to those from other sources enabling him to determine the place of origin and period during which each type was in use (Pope 1988: 32). In 1994, subsequent excavations of the forge floor uncovered a number of pipe bowls (n=12). Rather then create a new typology these were added to those already devised by Pope. In some cases the date range of certain pipe bowl types has been altered (denoted by an *). Refer to appendix A for descriptions of the various pipe bowl forms and the date ranges associated with each (Plate 5.1, 5.2 and 5.3).

Of the 138 pipe bowls that were excavated, 99 or 72% were located on the forge floor. An analysis of these pipe bowls and their associated date ranges have determined that the smithy was in use from 1610-1680. However, when looking at this date range it is important to take into account a number of factors. First, it is very possible that the blacksmith(s) periodically swept the floor of the shop. This would have inevitably resulted in many of the earlier pipe fragments having been discarded. Secondly, since this was a high traffic area it is possible that many of the earlier pipe bowls could have been trampled into hundreds of unidentifiable fragments. This ultimately would have resulted in a high proportion of the recovered pipe fragments representing the last years that the smithy was being utilised. In spite of this, some pipe bowl types (i.e. types A, B, C, and D) did have date ranges which correspond with a 1622 construction date. Determining when the smithy was abandoned was very difficult because many of the later pipe bowls have wide date ranges. What has to be remembered is that many of the pipe bowls that were manufactured around 1640 continued to be produced up until 1680. Therefore, much care must be taken when using these pipe bowls to determine the period during which the forge fell into disuse. It is important to mention that all the pipe bowls excavated from the forge floor fit into some date between 1620-1660 which was very likely the period during which this forge was being utilized. By examining other levels it will become apparent that this forge was likely abandoned in the 1650s. As mentioned earlier, stratum 2C likely represents the abandonment and initial filling of the forge. Even though only three pipe bowls were recovered, all had date ranges which suggest the forge fell into a state of disuse between 1640-1680. Twenty-eight pipe bowls from stratum 2B were also examined. As previously mentioned stratum 2B covered all of Area B and seems to be related to a late seventeenth-century domestic structure that was found to the north of the forge. Even though the majority of these pipe bowls (N=20) have a date range of 1650-1710 three fit into the range of 1620-1660. This is very important in that it suggests that the forge was abandoned around the mid-seventeenth century.

5.2.3 Maker's Marks

Another aspect of clay pipes that can assist in dating is the presence of makers' marks. These marks, which first appeared on pipes at the beginning of the seventeenth century, can be located on either the base, back and sides of the bowl, sides of the spur or base of the bowl, or on the stem (Oswald 1975: 62). Of all the pipe bowls that were analysed from the smithy, 15% were found to have makers' marks. It is important to mention that all the makers' marks were located on the flat base of the heel which seems to have been a trait commonly found on pipes dating to the first half of the seventeenth century (Noel Hume 1969: 304).

Makers' marks on the base of the bowl can take the form of either initials, full names, or symbols and can be applied in either relief or incuse design (Oswald 1979: 63). Interestingly, all the pipe bowls that had makers' marks were stamped in relief in the form of initials or symbols. Oswald states that both initials and symbols can be found on the base of pipe bowls throughout the seventeenth century.

When attempting to date a mark, it is important to take into account a number of factors. First, one must approximate the date of the pipe by bowl typology in order to establish a period during which the makers' initials would have existed. Second, it is important to analyse the style of each particular mark since this may give some indication of the date of the pipe (Oswald 1979: 62). Even though this should narrow down the number of possible makers, one still has to be very careful. For example, differentiating between makers who shared the same initials and existed during the same period is almost impossible to do. Also, the lists of all the makers, especially those pertaining to the early periods, are incomplete. Therefore, when establishing dates for specific maker's marks, one must be very cautious and explore all possibilities.

Before discussing the makers' marks it should be mentioned that many could not be positively associated with specific pipemakers. As a result all pipemakers who could possibly be attributed to each mark will be mentioned.

5.2.3.1 Initials

Of all makers' marks, those with initials were best represented in the sample. Of the total number of marked pipe bowls 12 or 57% had makers' marks in the form of initials. The most common stamp had the initials R.C. This mark was found on pipe bowls that were classified as type R which were manufactured possibly in either London or Bristol from 1640-1670 (Pope 1988: 19). Similar heelmarks were found on clay pipes excavated at Martin's Hundred and the Matthew's Manor site at Denbigh (Noel Hume 1979: 10). Even though an R.C. makers' mark was found on a London pipe that dated from 1640-1670 it differed from the Ferryland mark in that floral designs were located both above and below the initials (Atkinson and Oswald 1969: 182). London pipe makers who had these initials and operated around this period were Richard Coal (1615-59), Roger Clare (1631), and Richard Coxe (1634-38)(Oswald 1975: 134). Bristol pipe makers who also shared these initials are Robert Cable (1639-40) and Richard Cable (1643)(Oswald 1975: 151).

Four of the type I bowls (1640-1670) had the initials I.H. or H.I. Pope states that this particular mark closely resembles a form produced by John Hunt of Bristol (1651-1653)(Pope 1988: 19-20). However other Bristol pipemakers who shared these initials were John Harris (1641), John Haskins (1656), and John Holstead (1662). Pope also stated that it was possible that these pipes were produced in Marlborough, Wiltshire (Pope 1988: 18-19). Pipemakers from this area who had similar initials were John Howell (1650), and Jeffrey Hunt (1650-1670).

The excavations also uncovered one type U pipebowl which was clearly marked with the initials I.S. In between the initials was the representation of what is possibly a tobacco plant. Type U pipes were likely produced in London from 1630-1660. Unfortunately no similar marks were found in the documentary sources. It is possible that this mark could represent such London pipemakers as John Sharpe (1619), James Shepphard (1619), John Stapleton (1619), John Smith (1634), or John Stevens (1644)(Oswald 1975: 145). However, one makers' mark, which had the initials I.C., had a very similar tobacco plant motif between the letters (Atkinson and Oswald 1969: 182). This mark was on a pipe that was manufactured in London and dated between 1640-1670. It is quite possible that these marks are closely related.

5.2.3.2 Symbols

Makers' marks in the form of symbols represented 43% of all the marked pipe bowls. The most common symbol, which was located on eight type J pipes, was in the form of an eight-spoked wheel. This symbol closely resembles those found on pipes of Exeter which date from 1650-1680 (Pope 1988: 19). Pope also states that this eight-spoked wheel could have been a compass rose from a pipe trader catering especially to the maritime market (Pope 1988: 19).

The final mark was found on a heel fragment that was recovered from Feature 31. It was unique in that its design consisted of a stem and a flower (tulip) commonly referred to as a Dutch thistle (McCashion 1979: 64-65). Similar heelmarks have been found on pipe bowls recovered from the Oak Hill Mohawk site. McCashion states that this particular pipe dates from 1635-1645. Even though the specific maker is unknown this pipe probably originated in Amsterdam (McCashion 1979: 64-65).

Most of these makers' marks were found on pipes that were likely deposited in the latter years of the blacksmith shop's lifespan. This can be established through the analysis of the bowls on which they are located (a possible exception to this is the type U pipe with the I.S. stamp and the heel with the tulip motif). Like the pipebowls these marks seem to fall within the suggested period that the blacksmith shop existed (i.e. 1622-1650). However since none of the makers' marks could be identified with any degree of certainty, their value for dating purposes proved to be limited. Until these marks can be positively identified, only the pipe stems and the bowls should be employed for dating purposes.

5.3 Ceramics

Similar to pipe fragments, ceramics can also play a valuable role in dating a site. This concept was successfully demonstrated by South when he used ceramic fragments to date correctly a number of eighteenth-century historic sites. South's mean ceramic date formula is based on the premise that on eighteenth century sites there is a high correlation between the ceramic manufacture dates and the site occupation period (South 1978: 68). For a number of reasons, however, the mean ceramic date formula does not work well when using it to date seventeenth-century sites. First, there are fewer historical references to the manufacture dates of seventeenth-century ceramics. Second, our present knowledge of temporally significant attributes of seventeenth-century ceramics is not very well defined. These factors result in a broader manufacture time span for ceramics produced in the seventeenth-century which in turn reduces the correlation between manufacture dates and site occupation (South 1978: 68). As a result, it was decided that the mean ceramic date formula would not be used on excavated ceramics from the smithy.

For reasons previously mentioned, the ceramics that were excavated from the forge could not be used to determine a specific date range for the period of occupation of the shop. However, if this forge was in use between 1622-1650 then all the ceramics that were excavated from the occupational layers should have been available during this period. It will be important, therefore, first to identify each type of ceramic that was excavated from the blacksmith shop and then establish dates during which these types were being manufactured (Table 5.8).

An analysis of the ceramics excavated from the smithy found that they were consistent with the notion that the forge was in use from c. 1620-1650. What is also interesting is the high proportion of North Devon coarse earthenwares that were excavated from the smithy. As Figure 18 shows, over 71% of all the pottery that was excavated from the blacksmith shop was of North Devon varieties. High amounts of North Devon pottery were also discovered during excavations at the Kitto Institute site, Plymouth. Allan and Barber stated that such a high quantity of North Devon pottery pointed in favour of a early date range for the site, somewhere in the first half of the seventeenth century (Allen and Barber 1992: 226). This helped establish that the Ferryland blacksmith shop was occupied during the first half of the seventeenth century. It is also interesting to note that no ceramic types such as Westerwald stonewares or combed slipwares, which were first produced during the second half of the seventeenth century, were excavated from the smithy.

5.4 Glass

In total 315 fragments of glass were recovered from the forge, all of which were of the case bottle variety. This type of bottle has a square cross section widening from base to shoulder along with a short neck and indented base (Jones and Sullivan 1989: 72). The neck of the bottle commonly has an everted lip which was closed with either a simple cork or a threaded pewter collar and cap. As the name implies, these particular bottles were easily stored in crates, possibly up to twelve at a time (Noel Hume 1969: 62). Therefore, bottles of this shape would have proved to be very useful when shipping beverages to frontier sites such as Ferryland (Faulkner 1987: 232). Prior to the appearance of the globular bodied dark green bottles in the mid-seventeenth century, case bottles likely comprised a large portion of the English bottle output (Noel Hume 1969: 62). It is important to mention, however, that case bottles did continue to be used, possibly in a more limited extent, throughout most of the seventeenth century.

An interesting notion about the glass when considering the date of the forge is the fact that no fragments of those shaft-and-globe bottles or "onion bottles" were discovered. The earliest dated bottle of this type is 1651 although Noel Hume states that this form may have been preceded by one with a neck half its length, perhaps in about 1645 (Noel Hume 1969: 60). Even though Faulkner states that these types of bottles served primarily as decanters and therefore would not be commonly found in this type of context it is interesting to note that fragments of bellarmines, which likely served the same purpose, were found (Faulkner 1997: personal communication). Therefore, if this forge was in operation after 1650 it is surprising that no fragments were located. What is also important is that during excavations in other areas of the Ferryland site (i.e. Area C storehouse) these onion bottles have turned up very frequently in pre-1673 contexts. Therefore, if the smithy was operational after 1650 one would expect to have uncovered some fragments from these later shaft-and-globe bottles. Since only case bottle glass was excavated from the smithy, it is very likely that the blacksmith shop ceased to be used sometime before 1645-1650.

5.5 Jetton

Even though no coins were unearthed during the course of the excavation one brass jetton was discovered. The jetton, which measured 21.5mm in diameter, is of a type manufactured by Hans Krauwinckel (c.1580-1610) of Nuremburg (Plate 5.4). Jettons or casting counters were used on abacus-like devices for carrying out simple mathematical calculations (Noel Hume 1969: 171). This jetton was found south of the stone forge at the very deepest level of occupation and likely represents the very early period of the blacksmith shop's existence.

5.6 Summary

After a thorough examination of all the dateable artifacts it becomes clear that this smithy was in use during the first half of the seventeenth century. Analysis of both historical documentation and artifacts such as pipes, ceramics, glass, and the jetton all suggest a forge occupation date range of 1622 to approximately 1650. However, the most convincing evidence for this period of occupation is the absence of shaft-and-globe bottles. The fact that no fragments of these bottles were discovered in the forge levels suggests that the smithy was abandoned sometime in the late 1640s or early 1650s.

Chapter 6

Iron Artifact Assemblage

6.1 Introduction

Blacksmiths who operated at colonial or frontier settlements often had multi-functional roles. In addition to serving as the community's blacksmith it was not uncommon for them to also be farriers, gunsmiths, locksmiths, coppersmiths, and armours. Recent excavations carried out at Pentagoet, Fort Vancouver and Fort St. Joseph have determined that the local blacksmiths practised a number of these different occupations (Light and Unglik 1984: 38, Faulkner 1987: 135, Ross, Thomas, Hibbs, and Carley 1975: 423). Consequently, a major focus of this thesis will be determining the various functions of the blacksmith(s) who operated at Ferryland during the first half of the seventeenth century.

Establishing what particular trades were carried out by the smiths and the other Ferryland colonists necessitated a thorough examination of many of the artifacts excavated from the forge. Consequently, iron artifacts, such as tools, will be separated according to the trade they represent, such as blacksmithing, farming, and woodworking. Metal artifacts, other than tools, will be described in sections related to their function. For example, items such as nails will be mentioned under the heading of building hardware whereas iron handles will be described under furniture hardware. This was done in order to organise the artifacts into some sort of loose typology. Unfortunately, some of the metal artifacts that were recovered from the smithy could not be identified either because they have undergone so much deterioration or because they simply could not be assigned to any specific use. Besides iron, it is also important to examine artifacts made of lead, copper, and flint since these items could also be associated with some of the trades that were introduced earlier in this section.

By describing all the metal artifacts and their possible functions, I hope to determine the role that the blacksmith(s) played in shaping colonial Ferryland and how their work influenced much of the community.

6.2 Blacksmith's Tools

In addition to such basic equipment as the forge, bellows, anvil, and slack tub, the blacksmith also had a wide and varied toolkit (Bealer 1984: 74; DeVore 1990: 15). In it were the tools that helped the smith create a variety of items, such as other tools and building hardware, which were necessary for many daily activities (DeVore 1990: 15). During the course of the excavation a number of different blacksmith's tools were discovered including a hand vise, chisel, bench shears, tong ring, hand anvils and files. In the following section I will describe each of these tools and their associated functions.

Files

Files are metal bars which have a series of raised teeth or cutting edges designed to cut metal or wood by abrasion (DeVore 1990: 19). Even though the experienced smith could do much of the finishing work with both a hammer and flatter, the file was often used in order to shape pieces for the final fitting and to create pieces that would have been difficult to make by forging (Bealer 1984: 110). Another common function of the file was to sharpen edged tools (De Vore 1990: 19). Gunsmiths also considered the file to be a very important part of their toolkit since it was used in almost all phases of gun making (Brown 1980: 244). The gunsmith, like the blacksmith, would have possessed an assortment of files, each with a specific function. In most cases files were made from hardened iron with the cuts applied by hand or by machine (Smith 1966: 244-250).

Blacksmiths and other craftsmen would have used many different types of files. Consequently, files can be subdivided into three different types based on their shape, size, fineness of the cut, and function (Knight 1875: 840). The first type includes rasps which have separate, large, pointed teeth. The second type is referred to as mill files since they have cuts which resemble grooves on a mill wheel. The third variety are known as mill bastard files possibly named because the slanting cuts follow the direction of the bar sinister (i.e. up from left to right) in medieval heraldry (Bealer 1984: 110-111). Cuts on a file may be single (float), double (criss-cross), or rasp tooth. Also, files may come in a variety of shapes such as rectangular (flat), round, half round, square, triangular, and fusiform (cigar-shaped) (DeVore 1990: 19).

During the excavation of the smithy two well preserved files (#9098 and #9623) were discovered in the northern section of the shop. The fact that they were discovered near the likely position of the work bench is not surprising since files were commonly used in conjunction with a vise. Securing the object to the vise allowed the smith to carry out detailed and intricate filing work. It should be mentioned that these files could have been used for other purposes such as woodworking and farriering so it is possible that the smith was using them in this capacity as well.

File #9098 is similar to a mill bastard file since both of its flat surfaces are covered with single slanting cuts. This file is rectangular in shape with one end tapering into a point or tang. This file is 37.7cm in length, 2.5cm in width, and 1.7cm thick (Plate 6.1). Comparable to file #9098, #9623 also had single slanting cuts located over both of its flat surfaces. This file was more triangular in shape tapering to a point at one end. The other end projected out to form what is likely a tang onto which a handle would have been placed. This file is 22.1cm in length and had a maximum width and thickness of 3.6cm and 1.7cm respectively. Both files were made from hardened iron with the cuts applied by hand. Even though mechanical file makers were invented as early as the sixteenth century, they were never widely adopted until recent times (Bealer 1984: 110). Whether these files were made by the smith(s) at Ferryland or imported is a matter of conjecture.

Bench Shears

Bench shears were used to cut sheet iron up to one-quarter inch in thickness (Bealer 1984: 109). Shears of this type, which looked very similar to a huge pair of short-bladed scissors or tin snips, had blades that measured from six inches to one foot long. Extended directly out from the blades were two handles that varied in length from two to three feet. Frequently, the end of one of the handles was bent to a ninety degree angle so that it would fit into a hole in either the workbench or anvil or be gripped in the jaws of the bench vise. Usually two people were needed to use these shears in that one had to hold the sheet metal while the other cut it (Bealer 1984: 109, Hummel 1968: 195).

During the excavation one set of bench shears was unearthed in the northern section of the shop. Similar to the files that were found in the smithy, benchshears required the use of a workbench in order to operate them properly. Therefore, finding them in this location along with the two files adds credibility to the idea that the workbench was situated in this area. These shears have a maximum length and width of 38.8cm and 6.6cm respectively (Plate 6.2). An interesting feature of these shears is that the right angle turn section on one of its handles is missing. Consequently, it is possible that these shears were in the smithy to have this handle section replaced.

Hand Vise

The hand vise consisted of two jaws, sometimes equipped with teeth to provide a better grip, which closed with the help of a screw and wing nut (Hummel 1968: 204, Wylie 1990: 97). This type of vise was used when working with smaller objects, such as pins and gun parts. Even though there were various types of hand vises, all were used primarily during the process of filing so the smith could grip objects that would otherwise be too small for him to grip with his hands. If the smith were right-handed, the hand vise would have been held in his left while he filed with his right. Infrequently, hand vises would have been either clamped into larger vises or fitted with a handle to facilitate holding (Wylie 1990: 101).

As mentioned earlier, vises were tools commonly used by gunsmiths since they needed implements for holding or clamping smaller items (Brown 1980: 253). For example, the hand vise, which gunsmiths referred to as the mainspring vise, would have been used for either assembling or disassembling gunlocks or replacing broken springs. Mainsprings frequently needed maintenance as a result of hard use to which guns were often exposed (Brown 1980: 255). The maximum length of the vise is 14.6cm whereas the maximum height is 7.2cm (Plate 6.3).

Cold Chisel

A tool commonly used by the blacksmith to cut metal was the chisel. When struck by a hammer, the edge of this wedge-like tool would penetrate the metal and force its edges apart (Wylie 1990: 111). Blacksmiths used two types of chisels: the cold chisel and the hot chisel. As their names imply, the cold chisel was used when dealing with unheated stock whereas the hot chisel was used when cutting hot metal (Wylie 1990: 111). Cold chisels, which were highly tempered and therefore quite hard, commonly had very blunt edges. Hot chisels, however, were tempered to a lower temperature and had edges that were much sharper (i.e. edge about 30 degrees). Both the higher tempering and the blunter edge of the cold chisel made it very hard which was necessary when working with unheated stock (Wylie 1990: 111).

The most common type of chisel used by the blacksmith was the hand-held cold chisel. This type of chisel averaged from five to eight inches in length and from one quarter to two inches in diameter (Wylie 1990: 111). Cutting edges varied from the basic flat chisel (i.e. edge was flat and as sharp as possible) to the cape, round-nosed, and diamond point chisel. Hand-held chisels were preferred by smiths since it allowed them more precise control. They were most frequently used while working with stock placed on the anvil or in the vise (Wylie 1990: 113). Other types that were used by blacksmiths were referred to as hot or cold set chisels. These set tools were usually fitted with handles and used in conjunction with sledges to aid in splitting heavy stock (Wylie 1990: 111).

In the northern section of the shop, excavations uncovered what is possibly the lower portion of a chisel (Plate 6.4). This chisel fragment, which is 5.1cm in length and 1.8cm in width, displayed evidence of having been cut on the hardy by the smith. The lower tip of this chisel was both flat and relatively blunt therefore it is likely that it was the lower portion of a cold chisel. Even though it was common practice for most blacksmiths to make their own chisels, it is unknown whether this cold chisel was made at the Ferryland smithy or imported from elsewhere.

Nail Header

Since many smiths made their own nails and bolts it was common for them to possess a nail or bolt header. A header was a portable device with holes at one or both ends which enabled the smith to create a head on a partially finished nail or bolt (Wylie 1990: 134). Frequently the smith would have an array of headers with holes of varying size in order to create different sizes and shapes of nails and/or bolts (Wylie 1990: 134).

The nail header that was found in the southwest corner of Area C is quite large measuring 43.0cm in length and 4.6cm in width (Plate 6.5). Even though it was not discovered during the excavation of the smithy it is possible that it ended up at this location after the smithy was dismantled. It was found in a layer that consisted of numerous pieces of slag, brick and broken roof-slates which likely originated from the forge. The nail header was single-ended and had a raised platform at its distal end which possibly allowed the smith much easier manageability of the tool when heading a nail.

Hand Anvils

Two of the most interesting artifacts discovered during the excavation are items that closely resemble hand anvils. These two items (#11941 and #11773), which are circular in shape, have diameters of 5.4cm and 8.9cm respectively (Plate

6.4). Each anvil head is attached to an iron shaft which was presumably used to clamp the hand anvil into a vise before being used to shape metal (Hummel 1968: 156). These items are very similar to those that are illustrated by both Diderot and Hummel (Hummel 1968: 156). Hummel states that even though the function of these particular items remains unknown it is possible that in the case of the Dominy tool collection it was a part of their clock-shop equipment (Hummel 1968: 156). Even though it is doubtful that the Ferryland smiths used the hand anvils for manufacturing or repairing clocks, it is highly possible that they would have been used for shaping or repairing small metal items such as those associated with gunsmithing.

Tong Ring

An iron ring that was excavated from the smithy may have been used as a blacksmith's tong ring. Tong rings were round or oval rings that were used by blacksmiths to hold objects firmly in the jaws of the tongs. By slipping the ring over the tong handles until it became locked, the object that was being worked could be held tightly in place (Smith 1966: 148). This was useful since it would enable him to use his hands much more freely (Smith 1966: 148). Normally, a blacksmith would have several sizes of these rings in his shop since different sizes were needed depending upon the size of the object being worked. The iron ring that was excavated from the smithy has a diameter of 4.9cm. It should be mentioned that this iron ring may have also been used as a drop handle, ox ring, or some sort of ring used on the end of a tethering post.

6.3 Woodworking Tools

Analysis of the artifacts indicate that the smiths also spent some of their time repairing and/or manufacturing tools associated with woodworking and boat repair.

Axes

During the first years of settlement one of the most essential tools was the axe (Wylie 1990: 154, Miller 1980: 44). Axes played an important role in both the development and survival of the colonial village since they were used for such functions as clearing land for gardens and cutting lumber to use as building material and firewood (Wylie 1990: 154).

The process of making an axe was a very labour-intensive activity taking as much as seven to eight hours. For this reason, axes were most often made by larger manufactories than by smaller low scale smithies (Wylie 1990: 157). As a result, the smiths who worked in smaller shops spent most of their time repairing axes rather than manufacturing them (Wylie 1990: 157). Most axe repairs involved installing new cutting edges or bits. This process involved forging, welding, grinding, tempering, and polishing (Wylie 1990: 157). Prior to 1830 almost all axes were made from iron with the bit being the only part made of steel. Besides replacing bits, smiths also carried out such repairs as grinding, tempering, and sharpening edges that have become dulled with use (Wylie 1990: 157).

Next to the north wall of the smithy, excavations unearthed two complete felling axes. Axe #94397 has a length and width of 222.0cm and 57.6cm respectively with a maximum thickness of 15.0cm (Plate 6.6). This axe was found in an excellent state of preservation and was possibly in the shop to either be sharpened or fitted with another steel bit. Axe #97340 has a length of 187.0cm, width of 107.5cm and a maximum thickness of 14.0cm (Plate 6.6). Similar to the other axe this one was also found to be in excellent condition. Unlike the other axe, however, this one was likely in the smithy to undergo some major repairs. An examination revealed that one section of the eye of the axe was detached from the blade which resulted in the axe becoming slightly deformed (Plate 6.7). Consequently, this axe was possibly in the shop to have this section rewelded together.

Light states that if the smith was manufacturing axes, various items like discarded mistakes, clipped poll fragments, eye moulds, and the corner cuts made before inserting a bit should have been recovered (Light and Unglik 1984: 23). A poll end fragment measuring 10.4cm by 4.3cm was unearthed from the smithy (Plate 6.6). This poll end fragment, which looks to have been hot cut by the smith(s), could be evidence showing that the blacksmiths were involved in the manufacture of axes. It is also possible that this axe fragment was in the smithy to be used as reusable scrap. If the smiths were involved in the manufacture of axes one would think that more artifacts related to this activity would have been uncovered.

Gimlet

The gimlet was a very important tool for carpenters, coopers and gunsmiths. Related to the auger and to the brace and bit, the gimlet consisted of a twisted cylinder bit which had parallel, spiral wood cutting edges used for boring holes (Barnes 1988: 180; Hummel 1968: 82). Even though gimlet fragments have turned up in relatively high frequencies in other areas of the Ferryland site (i.e. Area C), only one was discovered from the floor of the forge (Plate 6.8). This gimlet fragment, which measures 4.1cm in length, is missing both the sharp screw point and the upper non-spiral section.

Saw Blade

Before the advent of the rolling mill, saw-making was a very difficult process with most saws being made by specialists in a few European centres (Bealer 1976: 196). Consequently the local smith was probably more involved in repairing saws rather than making them. One of the most common repairs that were carried out on saws was mending splits that would develop in the saw blade. The smith would repair these splits by brazing (Bealer 1976: 197).

Interestingly, a section of a large saw blade was recovered during the excavation of the blacksmith shop. The size of the saw blade and widely spaced teeth suggest that this particular saw fragment was from a large whip or pit saw. This type of saw was frequently used by carpenters and shipwrights for ripping large logs into planks and beams (Faulkner 1987: 142).

Forming Chisel

This particular artifact closely resembles the forming or firming chisel which follows the basic chisel design (Sloane 1964: 52). These chisels were used for many tasks but one of their common functions was to cut the superfluous wood from two auger holes in order to create a mortise joint (Sloane 1964: 52). This particular specimen measures 17.0cm in length, 4.9cm in width at the blade and 2.6cm in width at the handle (Plate 6.9).

Plumb Bob

With a maximum length and width of 5.9cm and 4.3cm respectively, this conical shaped artifact (Plate 6.9) closely resembles a plumb bob. The top section of this plumb bob has a hole that would have been used to attach the plumb line whereas the base looks as if it once had a tip which ultimately would have helped in determining the plumb point. Plumb bobs are very important in trades such as carpentry since they help in determining the true perpendicular or vertical on an upright surface (Barnes 1988: 188).

Wedge

Wedges were wooden or metal tools that were driven between two objects to either secure or separate them. Always tapering to a thin edge, wedges came in a variety of sizes. Excavation of the blacksmith shop unearthed one incomplete iron wedge having a length of 5.1cm and a maximum head width of 3.3cm.

Caulking Iron

Excavations just north of the stone forge unearthed what appears to be a caulking iron. Caulking irons were used to drive various types of material, such as oakum or cotton waste, into the seams of the hulls and decks of vessels (Barnes 1988: 164). The length of this example is 7.7cm; the maximum head diameter and shaft width are 3.8cm and 2.7cm respectively (Plate 6.9).

Plane Iron

One plane iron, measuring 11.2cm in length and 6.9cm in width was unearthed from the forge floor (Plate 6.9). Planes and their associated blades came in a variety of sizes and were used for a number of functions such as smoothing surfaces and creating joins (Sloane 1964: 56). It is possible that this bit was in the shop to have its edge resharpened.

6.4 Agricultural Implements

One of the rural smith's major functions involved both manufacturing and repairing agricultural equipment (Wylie 1990: 154). This equipment often varied from ground-clearing tools to cultivating implements and from hand tools to animal driven implements (Wylie 1990: 154). These items had a very important role in the colonial settlement since they were essential for the community to survive and progress.

During the excavation of the smithy a number of different items were discovered that would have been used in either clearing or cultivating land. In the following pages implements such as the mattock, hand scthye, axe, and spade will be discussed.

Mattock

The mattock was a tool that had both an adze and chisel edge at the opposite ends of the head. It was shaped very similar to a pickaxe and was used by farmers to prepare the soil for cultivation. One complete mattock was found in the southern section of the smithy very close to the back wall (Plate 6.10). It measures 34.2cm in length, 7.1cm in width and 8.2cm in height. Whether this tool was manufactured by the resident blacksmith(s) or just in for repairs is unknown.

Hand Scythe

One of the most common items repaired by smiths were scythes (Wylie 1990: 160). Harvesting implements, such as the hand scythe, were used for cutting cereal crops and hay (Smith 1978: 8). The scythe blade fragment that was recovered from the smithy measures 10.0cm in length with a maximum width and thickness of 2.7cm and 1.0cm respectively (Plate 6.11). This fragment closely resembled scythe blades depicted in Joseph Smith's *Key to Sheffield Manufactories* (Smith 1975). It is possible that this scythe blade was in the shop to have a tang for the handle reattached.

Spade

Spades and shovels are among the most common agricultural implements recovered from sites dating to the seventeenth and eighteenth centuries (Noel Hume 1969: 274). The fact that they were essential for such jobs as preparing land for cultivation, digging cellars and foundations for various buildings, and digging holes for fence posts and palisades, it is not surprising that they turn up in relatively high quantities.

Excavations at Area C revealed that the early colonists were involved in a very labour-intensive program of reclaiming the harbour and beach front or what Wynne described as "previously void or waste ground" with earth that was dug for several buildings (Pope 1993: 13). Captain Wynne also mentions the colonists erecting a seven foot palisade around the four acre settlement which also would have necessitated the use of implements such as the spade (Pope 1993: 12).

Excavation in the northern section of the smithy unearthed one large iron spade. The blade of the item was made completely of metal with dimensions of 50cm in length and 24cm in width (Plate 6.11). Interestingly, Noel Hume states that spades made entirely of metal were rarely used during the seventeenth century. He does mention, however, a detailed drawing made by Pieter Bruegel in 1565 which exhibits gardeners using spades with entire metal blades (Noel

Hume 1969: 274-275). Also, in a letter written in 1621 to George Calvert, Wynne writes "Some spades from London were necessary, if of the best making, also some good pick-axes, iron crows, and a smith, and also such as can brew and bake" (Pope 1993: 8). One could take the phrase "spades.... if of the best making" to mean he wanted spades with blades made entirely of iron. This particular specimen was found to be in an excellent state of preservation and was possibly in the shop to have the handle attachment fixed.

Axes

For a discussion of axes refer to the previous section describing woodworking tools.

6.5 Farriering

The farrier, who dealt primarily with the shoeing of both horses and oxen, would have played an integral role in the colonial settlement. Consequently, it was not uncommon for many blacksmiths to practice this craft. Farriers practised a skill that required knowledge in both the handling of iron and of the animals being shod. Draft animals, like horses and oxen, were used for a variety of tasks such as clearing and cultivating land, transporting various goods, and as a mode of transportation. Therefore the need to protect their hooves from the wear of hard surfaces would have made farriering very important (Smith 1966: 175).

In a 1625 letter, William Alexander wrote:

> "and within these three years Master Secretary Calvert hath planted a company at Ferryland, who both for building and making trial of the ground have done more than ever was performed before by any in so short a time, having already there a brood of horses, cows and other bestial, and by the industry of his people he is beginning to draw back yearly benefit from thence already..."(Pope 1993: 21).

From this letter we know that horses existed at Ferryland during the very early years of the colony. Accordingly, it was not surprising to find evidence of this particular trade during the excavation of the smithy. The excavation discovered a number of artifacts relating to this particular activity such as horseshoes, horseshoe nails, and one clinch cutter fragment. Similar to the smithy at Fort St. Joseph most of the items associated with farriering were concentrated at the front of the shop. A possible explanation is the smithy was too small to accommodate the shoeing of horses on the inside resulting in most of the work being done outside the shop (Light and Unglik 1984: 24).

Clinch Cutter

During the excavation one clinch cutter fragment was recovered from the floor of the forge. Clinch cutters were knife-like instruments that were used in conjunction with a hammer to cut off the clinched or bent nails which protruded from the sides of the hoof (Wylie 1990: 145). It was common practice for smiths to make their own clinch cutters instead of buying them (Smith 1966: 169).

The clinch cutter fragment measures 7.2cm in length and 1.4cm in width (Plate 6.12). It had an incomplete shaft so it is possible that this particular item was to be repaired by the smith.

Horseshoes

The farrier would have spent much of his time either repairing or making horseshoes. Horseshoes, which were manufactured from bar iron, were custom made to fit not just a particular horse but each of its hooves. Therefore, depending upon such factors as the type of horse or ox being fitted, the type of work it was involved in, the condition of the surface on which the shoes were being used, and each animal's particular attributes, each shoe could differ in size, shape, and weight (Williamsburg Craft Series 1971: 21).

Excavation at the smithy unearthed two horseshoes, one of which was found embedded in the thick layer of scale situated around the anvil post molds. Interestingly, neither shoe displayed any evidence of fullering or nail holes. It has been stated that fullering, which refers to the grooves close to the outer margin of the shoe in which nail holes are sunk, did not appear on English shoes prior to the mid-seventeenth century (Noel Hume 1969: 237-238). However, since no nail holes were found on the shoes it is possible that these were preforms.

Because of the scarcity of iron stock, many smiths collected the old horseshoes to use in making other items. In return the customer would have had the price of the new shoes reduced (Wylie 1990: 142). Since so few horseshoes were recovered during the excavation it can only be ascertained that farriering was not one of the smith's major activities. Two nails that looked very similar to horseshoe nails were also discovered during the excavation. These nails were described in a later section that list all the different types of wrought iron nails that were recovered from the smithy.

6.6 Building Hardware

The building hardware that was recovered from the blacksmith shop represents a mixture of items associated with both shop construction and with the repair and manufacturing activities of the smiths. However, whether such items as hinges, perforated straps, pintles, latches, eye bolts, staples, nails, and spikes were used in either the actual construction of the smithy or items that were manufactured or repaired by the smith to be used elsewhere is very difficult to determine. Therefore, unless it is stated, it should be assumed that these objects could fall into either one of these categories.

Nails and Spikes

Of all the iron items excavated from the forge, nails and spikes constituted the largest group of the total iron artifact assembledge. This is not surprising considering the important role that nails and spikes played in building construction, especially in seventeenth-century Ferryland. For example, excavations of the smithy, the house structure at Area D and some of the buildings that were connected to stone structures at Area C have uncovered a vast number of iron nails suggesting that they were constructed almost entirely of wood.

Wrought iron nails were made from long slim rods or "nail rods" usually about 1/4 quarter inch square. Manufactured in the rolling and slitting mill, nail rods in many cases were packed in bundles tied together with wire (Bealer 1976: 205). Bealer states that before the nineteenth century, however, it was common practice for blacksmiths in many isolated smithies to reuse scrap iron, such as old horseshoes, to manufacture nails if rods were not available (Bealer 1976: 205). Considering the isolated nature of Ferryland during the seventeenth century, it can be presumed that the reusing of iron scrap to manufacture nails would have been a common occurrence.

During the excavation a total of 326 iron nails was uncovered in the smithy, all of which were of the hand wrought variety (Plate 6.13). This was not surprising, since hand wrought nails were the only type available throughout the seventeenth century (Noel Hume 1969: 252). Unfortunately, many of the excavated nails were incomplete and heavily corroded, missing either the head and/or tip sections. This made it impossible to tabulate the percentages of the varying types of nails. However, by analysing sixteen complete specimens and some of the other diagnostic nail fragments that were recovered from the shop, it became possible to divide the nails into 17 different types. This classification of the nails was based on two sets of criteria: tip form and head form.

Nail tips varied in such forms as pointed, chiselled and splayed or spatulate ends. The chisel-tipped nail, which was made by hammer-flattening the nail point, was frequently used in order to prevent the splitting of the wood when going across the grain (Mercer 1975: 235). Nails that were manufactured with flat, lanceolate points or spatulate ends, however, were specifically constructed for the purpose of clinching (Mercer 1975: 235). Clinching a nail involved curling back the tip in such a way that it would have been driven back into the wood. This would provide the best grip especially when dealing with overlapping boards, door battens, gates, hinges, latches, bolts, locks, etc. (Mercer 1975: 235). Interestingly, many of the nails found during the excavation of the smithy were clinched.

Analysing the nails to determine those that were clinched helped separate those nails that were used in the actual construction of the smithy as opposed to those made by the smiths to be used elsewhere. An analysis of the complete collection showed that most of the recovered nails had tips that were pointed while chiselled and spatulate ends were not well represented.

The heads of the nails also came in a variety of forms such as T-shape, L-shape, square, rectangular, round, oval, and rosehead. An analysis of the head forms show that the square and rectangular heads were the most common types recovered. It has been stated that T and L-shaped nails were used in floors, window and door boxings, cornices, fireplace facings, and chair racings since the heads of these nails could be counter-sunk (Mercer 1975: 235-237). Rarely, some nails were found to have relatively large thin heads, which are characteristics found on slater's nails. Since we know that many of the colonists' structures were roofed with slate (i.e. storehouse at Area C and the smithy), it is possible that the smiths were manufacturing nails specifically for this purpose. Slating nails were fashioned in such a way that it prevented the roof slate from riding over the head of the nail and sliding off the roof (McCawley 1938: 119). Another unique type of nail has a square hole passing completely through the shaft just below the head. Kidd has described similar types stating they could have been used to insert into a slot or hole and caught with a drop-key (Kidd 1949: 94-95). However, in this example the hole is very small, making this function very unlikely. Another unusual nail that was found during the smithy excavation closely resembles a wedge. This particular nail, which measures 53.0mm in length, is very similar to a wheel nail illustrated in Diderot's encyclopedia (Diderot as in Williamsburg Craft Series 1971: 19). Excavations also uncovered two heavily rusted nails that appear to be very similar to horseshoe nails. These types of nails had to be flexible enough to allow for easy clinching while strong enough not to break (Smith 1966: 205). Since only two horseshoe nails were found it can be assumed that the shoeing of horses or oxen was not one of the smith's major activities. In all the nails the shafts were found to be either square or rectangular in shape.

Unlike the high quantity of nails that was recovered from the blacksmith shop, excavations discovered only four spikes. To help distinguish between nails and spikes, any "heavy nail five inches or more in length" (i.e. 137mm or greater) will be classified as a spike (Kidd 1949: 93). To determine the different types of spikes the same classification system that was used on the nails was employed.

The following paragraphs briefly describe the different types of nails and spikes that were recovered during the excavation of the smithy.

List of Nail Types

Type 1

This type of nail consists of a rectangular shaft with a L-shaped head and pointed tip. The length of this type of nail ranges from 95mm to 105mm.

Type 2

Characteristics of this nail are a rectangular shaped head and shaft along with chiselled shaped tip. The length of this type of nail ranges from 78mm to 125mm.

Type 3

This type of nail has a rectangular shaped head and shaft plus a tip that is spatulate in form. The length of this type of nail varies from 44mm to 95mm.

Type 4

This type of nail has both a rectangular head and shaft in addition to a pointed tip. The length of this type of nail ranges from 47mm to 78mm.

Type 5

This type of nail has a rectangular head, square shaft, plus a point that is chisel formed. The length of this particular nail was 87mm.

Type 6

This type of nail has a square head, rectangular shaft, and a pointed tip. The length of this particular nail is 96mm.

Type 7

Characteristics of this type of nail is a oval shaped head, square shaft, and a pointed tip. The length of this nail ranges from 65mm to 83mm.

Type 8

This type of nail has an oval head, rectangular shaft, and a pointed tip. The length of this nail is 57mm.

Type 9

This type of nail has a rosehead, rectangular shaft and a pointed tip. The length of this particular nail is 46mm.

Type 10

Only one nail of this type was found in the collection. Characteristics of this type of nail are a very small rectangular head and a square shaft in addition to a spatulate shaped point. The length of this nail is 110mm.

Type 11

This type of nail has both a round head and a square shaft. Since no complete nails of this type were discovered maximum lengths could not be determined.

Type 12

Characteristics of this type of nail are a hexagonal shaped head and square shaft. No complete nails of this type were found therefore maximum lengths could not be determined.

Type 13

This type of nail consists of a rectangular shaft with a T-shaped head. Since none of these nails were complete, maximum lengths could not be determined.

Type 14

This unique example has a triangular shaped head that extends to one side along with a rectangular shaft. This nail was incomplete therefore its maximum length could not be determined.

Type 15

This particular type of nail has a hole passing through the shaft just below the head. Only one example of this type was uncovered. This complete nail had a square head, square shaft and pointed tip. It measured 79mm in length.

Type 16

This wedge-shaped nail has a rectangular shaft and no diagnostic head, even though the top is square in shape. According to Diderot this particular type of nail was referred to as a wheel nail. Only one nail of this type was recovered during the excavation. The maximum length of this nail is 53mm.

Type 17

The head of this type of nail, which is triangular in profile, closely resembles the heads that are found on horseshoe nails. This nail, which measures 52mm in length, has a head and shaft that are both square in shape.

List of Spikes

Type 1

Two spikes of this type were excavated from the forge. The maximum length of both #103640 and #107194 is 240mm and 130mm respectively. Both the head and shaft of these spikes are rectangular in shape while the tips are pointed.

Type 2

This type of spike has a square head, rectangular shaft and a pointed tip. The length of this spike (#7904) is 168mm.

Type 3

This spike (#103916) measures 143mm in length. The head of this spike is oval whereas the tip is pointed.

Type 4

This spike (#99431) measures 198mm in length. Both the head and the shaft of this spike are square while the tip is quite blunt. This is the largest of all the spikes that were excavated from the smithy.

Eye Bolts

Excavation of the smithy uncovered one wrought iron eye bolt. This eye bolt, which has a pointed shaft and a looped head, measures 6.4cm in length and 2.7cm in width (Plate 6.14). Eye bolts were commonly used as simple hinges in such a way that both bolts would have been interconnected through the loops. With this setup, eye bolts often served as hinges on such items as wooden boxes with loose-fitting tops (Brain 1979: 156). These bolts were also frequently mounted on doors and jambs in such a manner that when the door was closed a headed bolt placed through the eyes, or even a padlock, could secure both door and jamb together (Simmons and Turley 1980: 142). Eye bolts could also be used in conjunction with pintles to serve as hinges.

Staples

The smithy excavation uncovered two wrought iron staples. These staples, which typically had pointed ends, were used for such purposes as fastening a hasp to a door, or to act as the eye for hasp, etc. Both of these staples are round-headed with heights varying from 5.7cm and 5.2cm and widths varying from 2.9cm to 2.2cm (Plate 6.14).

Hinges

During the course of the smithy excavation six hinge fragments were unearthed. The hinges include strap, side, butterfly and butt hinges.

The large strap hinge (#5045) that was recovered in the northern section of the shop and measures approximately 31.7cm in length and 5.1cm in width (Plate 6.14). This type of large hinge, which was commonly referred to as the T-hinge, was often used on the doors of barns, stables, and bulkheads. It was set up so that the crosspiece was anchored to a frame while the long strap was attached to a door (Noel Hume 1969: 236). Since it was discovered near the north wall it is possible that this hinge was used in the actual construction of the blacksmith shop.

Hinge fragments #9146, #99536, and #97627 all represent fragments of smaller strap hinges. In their original state these strap hinge fragments were manufactured with one end of the hinge formed into a loop so it could be used in conjunction with a pintle (Noel Hume 1969: 236). This type of hinge was not only used to hang doors but also to bind together the batten doors to which they were attached (Faulkner 1987: 96). Fragment #9146 represented the loop section or "gudgeon" that measures approximately 5.1cm in width and 3.2cm in length (Plate 6.14). Hinge fragments #99536 and #97627 consisted of the "strap" sections of the hinges. Hinge #99536 measures 17.4cm by 2.9cm while hinge #97627 measures 30.2cm by 3.2cm (Plate 6.14). These types of hinges usually had holes spaced close together near the gudgeon to aid in weight bearing (Faulkner 1987: 96). Since these sections were not massive, it is possible that they would have been used for smaller gates, doors, and shutters.

Hinge fragment #9024 is a type referred to as a side hinge. Its maximum length is 8.9cm compared to a maximum width of 6.7cm. Faulkner states that this type of hinge was restricted to lightweight applications since it only attaches on the jamb side and does not secure the door or window together. It was particularly well suited for frame construction features such as hanging casement windows (Faulkner 1987: 97). Side hinges were also used in conjunction with pintles.

The gudgeon sections of the strap and side hinges were formed by simply wrapping them around a mandril. This method of hinge manufacture seems to have been very common throughout the colonial period continuing up to the early part of the eighteenth century (Faulkner 1987: 97).

The other section of strap and side hinge necessary to make them operational was the pintle. Pintles were made from a single piece of bar stock shaped into a right angle with one section formed into a point that was driven into wood or a masonry jamb while the other was rounded to a size to fit into the gudgeon (Faulkner 1987: 95). Excavation of the smithy uncovered two complete pintles. The smaller pintle measures 5.2cm in length at the tapered end and 4.1cm at the rounded end (Plate 6.14). This type of shorter pintle may have been used to hang light doors or shutters (Kenyon 1986: 32). The larger pintle measures 9.8cm in length at the tapered end and 6.0cm at the rounded end. This larger type of pintle was likely used to hang heavy doors.

Hinge #103372 represents a fragment of a butt hinge. This incomplete iron butt hinge or H-hinge measures 7.4cm in length and 6.0cm in width. The butt hinge, like the side hinge, was also used for such purposes as attaching shutters to windows or hanging light doors (Light and Unglik 1984: 18; Faulkner 1987: 97).

6.7 Furniture Hardware

Analysis of the artifacts confirmed that the smiths spent some of their time manufacturing or repairing small domestic objects. This is indicated by the number of iron and brass artifacts such as handles, hasp, and furniture nails recovered from the floor of the smithy.

Handles

Artifact #103415 is an iron handle measuring 10.9cm in length (Plate 6.15). This handle was manufactured so it could be attached to a surface by screws. It was likely intended to be used on a cupboard door.

Handle #99535 measures 4.7cm in length and 4.7cm in width (Plate 6.15). This type of handle was frequently applied to larger storage chests by attaching them to metal back plates (Barnes 1988: 60).

As mentioned earlier the iron ring that was discovered on the floor of the forge may have been used as a drop handle. Commonly used as door handles, round drop handles were mounted to doors by using eye bolts (Simmons and Turley 1980: 148).

Hasp

One complete hasp was discovered during the excavation of the blacksmith shop (Plate 6.15). Hasps of this variety, which were manufactured from slender iron rods, would have commonly been utilized on chests (Kenyon 1986: 36). This particular hasp, which is very similar to one of the hasps excavated at Fort Albany, is hinged and measures 10.6cm in length (Kenyon 1986: 36).

After analysing the collection it becomes evident that the smiths spent much of their time manufacturing and repairing items associated with both building construction and furnishing. The fact that items such as hinges, nails, pintles, hasps, and spikes turn up in relatively high quantities attest to the notion that the manufacturing and repairing of such items made up much of the smiths' daily activities.

6.8 Gunsmithing

The early colonists considered the gun to be one of the most important survival tools. In addition to providing both an individual and collective means of offense and defence it proved to be very helpful in hunting and in providing protection of both crops and livestock from predators. Perhaps most importantly, however, the gun also gave the early colonists a much needed sense of security (Brown 1980: 84). Since the art of gunsmithing was considered an important trade it is not surprising to find that many of the blacksmiths who worked in colonial settlements also served as gunsmiths. Brown states that although gunsmiths were usually proficient at blacksmithing, blacksmiths were not often qualified gunsmiths except for making minor repairs. However, he also mentions that on the frontier and when dealing with Native Americans, it was not uncommon for many blacksmiths to frequently double as gunsmiths (Smith 1980: 248). For example, it seems very likely that the Englishman James Read, a blacksmith who was involved with the first colonization attempt at Jamestown in 1607, engaged in the repairing of many of the early colonist's guns (Smith 1980: 149). Also, excavations at the French Fort of Pentagoet suggests that the resident blacksmith was very much involved with the repairing of guns (Faulkner 1987: 145-151). Similar to the blacksmiths in many other colonial settlements, the Ferryland smiths were also involved in gunsmithing.

During the excavation of the Ferryland smithy a number of tools and gun parts were recovered suggesting that the resident blacksmiths were engaged in both the repair and maintenance of guns. Implements excavated at the blacksmith shop, such as the hand vise, gimlet, reamer and files are tools that would have been an integral part of the gunsmith's toolkit. Further evidence of gunsmithing is displayed by the two items that closely resemble hand anvils. Hand anvils used in conjunction with a vise would have been used for shaping and repairing small metal items such as those associated with gunsmithing. Gun parts that were recovered include such items as a gun lock, main spring, frizzen, and a section of an exploded gun barrel. Analysis of the artifacts and early documents also seem to suggest that the smith(s) were involved in the manufacture of gunflints, gunspalls, and lead shot.

6.8.1 Gunsmith's Tools

These tools include the files, gimlet, hand anvils, hand vise, and reamer that were recovered from the blacksmith shop. Except for the reamer, all of these other items have been previously mentioned therefore it is not necessary to describe them again.

Reamer

Excavated from the floor of the smithy was an iron artifact that closely resembles a gunsmith's reamer (Plate 6.16). The reamer was a tool used by gunsmiths to bore and/or widen the barrel of guns and the powder chamber that is located in the breech (Brown 1980: 258). If in fact this tool is a reamer, it offers strong evidence that at least one of the smiths was involved in the repairing of guns.

6.8.2 Gun Parts

This section of the paper will describe the various gun parts discovered during the excavation of the smithy.

Gun Lock

Excavations of the smithy unearthed one incomplete gun lock. This gun lock was of a type referred to as an English lock, or dog lock, having both the pan cover and the battery made as one piece (Gill 1974: 5). Another unique feature of this dog lock was that the cock had a "safety" or half-cocked position (Peterson 1956: 28). In the dog lock this safety position was accomplished by hooking a small dog catch to the back of the cock which hooked over its tail to prevent it from moving forward (Noel Hume 1969: 213; Peterson 1956: 28-29). This dog catch was installed on these locks to prevent the gun from firing accidentally since without the catch the gun could not be carried in the cocked position (Noel Hume 1969: 213). Peterson states that this type of lock was widely used in Colonial America from about 1625-1675. However, since both the internal and external features of these dog locks have underwent a long evolutionary development, it is possible to date most specimens much more closely (Peterson 1956: 29).

The dog lock that was excavated from the blacksmith shop measured 17.5cm in length, 6.5cm in height and 0.5cm in thickness (Plate 6.17). The plate section of the lock is incomplete missing both the end of the plate that terminated in a ball finial and the section that had the dog catch attached to it. Even though this section is missing the plate is still long and slender, a characteristic that is found on most dog locks dating from 1625-1650 (Peterson 1956: 29-34). Another feature of this lock that is similar to early dog locks is the shape of the cock. On early dog locks the cock is in the shape of an elongated "S", being more angular than curved, whereas on later dog locks the S-shaped cock became solid in the lower curve and more goose neck in shape (Noel Hume 1969: 213; Peterson 1956: 36). Internal mechanisms present on this particular gun lock also point to an earlier style. For example, similar to the very early dog locks the sear does not touch the tumbler. Also, the sear on this lock acted laterally, as opposed to vertically, which was a feature that English gunsmiths stopped making shortly after the middle of the seventeenth century (Peterson 1956: 30-31). This particular dog lock is almost identical to an early dog lock that was excavated at the site of a seventeenth-century outpost at Yorktown, Virginia (Peterson 1956: 25).

The dog lock that was excavated from the shop was missing the end section of the plate, the dog catch, and the jaws of the cock which held the flint in place. Whether this happened after it was lost or discarded or during use is unknown but it is possible that this dog lock was in the smithy to undergo repairs to either one or more of these parts.

Main Spring

One of the most common gun parts that needed to be repaired or replaced by the gunsmith was the main spring. During the excavation of the blacksmith shop a broken main spring was discovered. The main spring fragment consisted of the segment that would have remained attached to the gunlock after it had broken. It is likely that this section would have been removed by the smith after the gun had been brought in for repair (Light 1984: 30).

Frizzen

The frizzen was the name given to the gun part consisting of both the battery and the pan cover found on later flintlocks such as the English lock or the dog lock (Noel Hume 1969:213; Peterson 1956: 28). The frizzen was held in place by a V-shaped spring referred to as either the feather spring or frizzen spring which allowed it to pivot on the lockplate. This enabled the frizzen to fall backwards automatically and to uncover the pan when struck by the flint that was held in the cock. This technological improvement, not found on the snaphaunce, made the English lock a much faster device in that it eliminated one motion and resulted in a simpler mechanism by replacing the sliding cover machinery (Peterson 1956: 28). This improved lock was first developed during the first quarter of the seventeenth century (Peterson 1956: 28).

One complete frizzen was found during the smithy excavation (Plate 6.16). Since this frizzen displayed no evidence of damage it is possible that it was salvaged from a worn out gun lock to be used as a replacement part. Although it is unknown whether this frizzen came from an early or later gun lock, it is very similar to the one located on the early dog lock that was previously described in this section.

Gun Barrel

One fragment of an exploded gun barrel was found on the forge floor. This piece, which measures 7.9cm in length, had a cylindrical shaped interior and an octagonal shaped exterior. It was probably from a gun that was brought into the shop to be either salvaged for parts or repaired. Unfortunately, no other part of this barrel was recovered. In a letter written in 1622 Captain Edward Wynne asks Sir George Calvert to send the colonists "two fowling pieces of six foot in the barrel and one of seven foot" (Pope 1993: 18). From this description of gun barrels it is very possible that the excavated barrel fragment is only a small portion of what would have been originally a very long piece.

6.8.3 Gunflints

Associated with flintlock firing mechanisms, like the dog lock, are sparking devices referred to as gunflints. Gunflints are very important since they provide the spark necessary to ignite the powder that was placed in the pan which in turn ignited the charge in the barrel. The gun parts that were found in the smithy were all related to types having flintlock mechanisms. Consequently, the discovery of four complete gunflints and six gunflint fragments during the excavation of the forge floor was not unexpected (Plate 6.18). The gunflints were all of types commonly referred to as gunspalls. Gunspalls are short flakes which may be struck from either a concave or convex surface of a flint core. Near the point of impact the spall is bulbous in shape and usually rounded by secondary flaking. From this bulbous section the spall tapers down to form a "feathered edge" which is typically thin and square. It is the thick back end of the spall which fits into the jaws of the guncock allowing the sharper end to strike off of the steel battery or frizzen (Faulkner 1987: 151-153; Noel Hume 1969: 219-222).

The ten gunspall and gunspall fragments that were excavated from the floor of the forge varied both in size and in the types of flint that were used (Table 6.1). The colour of the spalls varied from dark grey to light grey in addition to one that was made from a beeswax coloured chert.

Determining whether all or some of these gunspalls were manufactured at the smithy is very difficult to ascertain. Even though Faulkner has found evidence that gunspalls were being manufactured locally at Pentagoet during the beginning years of that settlement, he does state that evidence for gunflint manufacture in other North American outposts is very unusual. The more excepted notion is that gunflints were being produced in Europe and from there were supplied to the overseas colonies (Faulkner 1987: 153). Of all the gunspalls that were recovered from the forge only two showed evidence of having been manufactured by a skilled flintknapper. The other gunspalls were all crudely made and did not fit into the conventional gunspall form. The fact that these spalls were of a poor quality adds credence to the idea that these gunflints were produced locally by an unskilled flintknapper rather than having been imported from abroad. This is further reinforced by Noel Hume who states that seventeenth-century gunspalls can be found in all sorts of shapes, many of which were manufactured by unskilled knappers, such that some spalls are no more than slightly tapering chunks of stone (Noel Hume 1969: 220). One bit of evidence that argues against this idea of the spalls having been manufactured locally is the fact that no cores were recovered. At Pentagoet, it was the uncovering of both cores and core fragments throughout the blacksmith shop which led Faulkner to confirm that gunspalls were produced locally with only the raw material being imported (Faulkner 1987: 151-155). Consequently, it seems unlikely that the Ferryland blacksmiths were involved in the manufacture of gunflints.

Using both gunflint length and regression formulas archaeologists have been able to determine such attributes as function, usewear and weapon types (Stone as in McAlleese 1990: 54). Unfortunately regression analysis could not be undertaken in this study because of the small sample of gunflints. However, by analysising the excavated gunflints visually, it was determined that six of the flints were discarded because of use. Through use, gunflints were frequently being resharpened, which resulted in the shortening of the flint (Stone as in McAlleese 1990: 54). This ultimately resulted in the gunflint having to be replaced after about 20 strikes even though some may have been used for up to 35 strikes in a flintlock gun (Brown 1980: 79-80). Since four of the gunflints exhibit excessive wear, it is likely that they were discarded in favour of newer ones. This damage to the flints may have resulted from a combination of improper positioning of the flint in the cockjaws or the use of poor quality flint (Brown 1980: 79).

6.8.4 Lead Shot

Another task associated with gunsmithing is the production of lead shot. Excavation of the smithy unearthed a number of lead shot which came in a variety of sizes (Plate 6.19). Analysis of the shot and other excavated material, such as lead sprue, indicate that the majority of the lead shot was cast in gang molds. Lead shot that were made in this manner frequently have both a seam and a cut-off mark as opposed to the dimple found on the surface of shot made by the Rupert process (Faulkner 1987: 155). The fact that the shot were made in gang molds is not surprising since Captain Edward Wynne in a 1622 letter asked Sir George Calvert to send the colony "a mold to cast shot of several sizes for fowling" (Pope 1993: 18).

6.9 Trapping

In many colonial settlements trapping would have been considered a very important daily activity. Besides hunting animals for their warm pelts, their meat would have also been an important addition to the colonists daily diet. This is evident in a 1622 letter written by Ferryland colonist Nicholas Hoskins when he discusses in detail how he and a number of other settlers hunted a variety of land animals such as bear, fox, cattagenas (lynx), and otter for both their pelts and meat (Pope 1993: 21). Since traps could have been used to capture these animals it is likely that the smiths would also have been involved in the repair and/or manufacture of these items.

Before describing the trap parts that were excavated at the smithy it is first important to discuss trap sizes and their associated functions. Basically there are three different sizes of traps. In the literature small traps were commonly referred to as rat traps whereas medium and large traps were known as beaver and bear traps respectively (Light and Unglik 1984: 27). However, even though traps can be referred to as one of these types there are wide variations within each group (Light and Unglik 1984: 27). This large variation was a result of the kinds of material that were used in trap making and the individual preferences of the trap maker (Light and Unglik 1984: 27-28). As Light points out, however, there is still a correlation between the size of the trap and the kind of animal being sought since if the trap is too small it will not hold the animal whereas if the trap is too large it may break or cut the animals leg thereby allowing it to escape (Light and Unglik 1984: 28). It was this idea of the holding power of the trap and the fact that this depended upon the trap spring that led Light to conclude that this piece may provide the best information about the kind of animal being trapped (Light and Unglik 1984: 28).

One of the trap parts that was uncovered from the forge floor was a set of trap jaws (Plate 6.20). When opened these jaws would have had a spread that measures approximately 33 centimeters (13 inches). When compared to the jaw spreads of traps of known use it is very likely that this set belonged to either a bear or wolf trap. Carl Russell in his book, *Firearms, Traps, and Tools of the Mountain Men*, describes two early traps which were used to hunt both bears and wolves. The jaw spreads of the traps were 16 inches and 13 inches (Russell 1967: 109-115). In either case these traps, including the specimen excavated from the smithy, were very likely intended to trap larger game animals.

Another trap part that was uncovered on the smithy floor was a large trap spring (Plate 6.20). This spring, although incomplete, measures 23.5cm in length. The lower section of this spring displays evidence of having been hot-cut by the smith. Fortunately, trap springs can assist in identifying the type of animal that the trap was intended to catch. Light's trap spring classification system is based on the premise that if the interior diameter of the trap spring eye is 2-3cm then the trap was intended for medium sized fur bearing animals. Consequently, if the diameter is less than then 2-3cm the trap was likely a rat trap and anything greater a bear trap (Light and Unglik 1984: 28-29). In this case the interior diameter of the spring is 3.8cm suggesting that the trap was intended for larger animals.

Broken trap parts were frequently used as a source of reusable metal. Consequently, it could have been the intention of the local smith to use these particular trap jaws for this purpose.

6.10 Locksmithing

Some of the artifacts that were recovered from the forge suggest that the smiths were involved in locksmithing. Even though it is doubtful that the smiths would have been specialized in this craft, it is conceivable that they could have carried out minor repairs on various locks and keys. The fact that the blacksmiths had tools such as a hand vise and two hand anvils reinforces this idea since these tools were predominately used when working on smaller items that needed precision work like those associated with locksmithing.

Locks

Excavated from the floor of the smithy was the bolt section of a plain stock lock (Plate 6.21). This stock lock, which measures 25.1cm in length and 3.8cm in width, would have likely been used on an outer door. It was found in the back portion of the smithy (i.e. not in the vicinity of the door) therefore it is unlikely it had a role in the actual construction of the blacksmith shop. It is possible that the blacksmiths were either going to carry out some repairs on this item or use this lock fragment for reusable scrap. Even though it is rare to find a complete plain stock lock their individual parts are frequently encountered on historic sites. Noel Hume states that this type of lock was the cheapest and most commonly used door lock in both the seventeenth and eighteenth centuries (Noel Hume 1969: 244).

Keys

Two complete and two incomplete key fragments were recovered from the shop. One of the complete keys (#78665) measures 8.3cm in length and has an oval-shaped and flat-sided head in addition to a round shaft and a square lock end. The other complete key was quite large measuring 14.3cm in length (Plate 6.21). Similar to the other key this specimen also has an oval-shaped head that is flat-sided, square lock end, and a shaft that is round in cross section. The two key fragments consists of the lower sections from two different keys, both having square lock ends and round shafts. Interestingly, one of the key fragments looks to have been part of a blank. All are made of wrought iron.

6.11 Coppersmithing

During the course of the excavation over 334 fragments of copper were recovered from the smithy. Even though many were unidentified, a majority of the recognizable fragments represented pieces of copper/brass kettles and pots. Copper and brass kettles and pots were common items throughout the seventeenth and eighteenth centuries, and for that reason they were frequently repaired or reused by blacksmiths. People have suggested that the reuse of kettles as a source of copper or brass to make other items was primarily a tradition carried out by Native Americans (Quimby as in Faulkner 1987: 156). However, after analysing the copper excavated from the forge it becomes obvious that the Ferryland blacksmiths were also engaging in this practice.

The collection of copper excavated from the smithy suggests that the repairing of kettles and pots made up a high proportion of the smith's daily activities. To repair these items, old copper kettles that were not worth mending would have been salvaged and reused as a source of material to manufacture such items as rivets, roves, patches, and lugs (Light and Unglik 1984: 31). Fortunately, the excavations at the smithy site turned up many of these particular items. One patch in the collection, which measures approximately 6.1 by 6.0cm, still had eight copper rivets embedded in it (Plate 6.22). Rivets were made by rolling diamond-shaped pieces of sheet copper into cones and then flattening the top (Faulkner 1987: 157). Their most common functions were to patch leaks or reattach handle lugs to kettles (Faulkner 1987: 157). In addition to the patch mentioned above, other kettle fragments, such as lugs, were often found with a variety of rivets embedded in them (Plate 6.22). Whether these rivets were original or added later is very difficult to determine. Along with these finished rivets some preforms were also discovered. Further evidence representing both the repairing and reuse of worn out kettles is evident in the many strips of copper that were recovered from the forge. These strips almost surely originated from both kettles and pots which were cut up with shears or chiselled and filed to make many of the items previously mentioned.

Faulkner states that recycled copper kettle parts could be used in gunsmithing as both a source of raw material for brazing and also for the occasional fitting. For example, at Pentagoet excavations uncovered a copper musket butt plate created from brass scrap (Faulkner 1987: 157). Unfortunately, there is no evidence of this type of practice occurring at the Ferryland smithy.

Unlike excavations at Pentagoet, no copper or brass artifacts recovered from the smithy represented items having an ornamental function. At Pentagoet items such as brass tinkling cones, lace tips, copper tubes, and a disk having perforations in the shape of a cross were uncovered. Whether these items were not considered important enough for the Ferryland smiths to create or simply did not survive, objects of these types were not discovered. A possible reason that could explain why no copper or brass ornamental objects were being produced is that the Ferryland colonists had no relations with the resident Beothuk population. It has been noted that in situations where colonists had relations or contact with native populations copper items, such as those previously mentioned, were often used as trade items (Faulkner 1987: 157). It is important to mention, however, that at Pentagoet copper items, such as lace tips, which were used extensively for fashionable dress, were being manufactured by the smith primarily for the resident European population (Faulkner 1987: 157).

6.12 Fishing

Considering the fact that Ferryland was one of the most important fishing settlements in the North Eastern Atlantic throughout much of the seventeenth century it is only logical that items related to this occupation were unearthed from the smithy.

Fish Hooks

During the excavation three complete fish hooks were discovered in various sections of the blacksmith shop. The hooks, which were made of iron, measure 6.5cm, 8.4cm and 9.0cm in length (Plate 6.23). Unlike the modern fish hook, these three specimens lacked the characteristic eye. In order to attach these hooks to a line, the tops of the shanks were slightly everted and then widened by being hammered flat (Kenyon 1986: 41).

Anchor Fluke

Anchor flukes are the broad triangular plates that are located on the arms of a ships' or boats' anchor. During the excavation one anchor fluke measuring 18.2cm in length and 10.0cm in width was unearthed (Plate 6.23). It is possible that this anchor fluke would have been used as a source of reusable stock by the blacksmiths. During the seventeenth century many of the colonists living at Ferryland would have been heavily involved in the fishery. Also, many larger boats, such as sack ships, would have periodically docked at the harbour. Consequently, it is likely that the local blacksmiths would have spent much of their time making and repairing a variety of ship parts, such as anchors, for both local fisherman and visiting seaman.

Fishing Prong

Two of the most puzzling artifacts that were recovered from the smithy could have possibly been fish prongs. Similar types of items, referred to as pews, are depicted in an illustration found in B.A. Balcom's book, *The Cod Fishery of Isle Royale, 1713-58*. If these items are prongs, they would have been attached to long wooden poles and used in the process of transferring fish from the boat to the stage. These particular objects measure 35.9cm and 42.8cm in length (Plate 6.23).

6.13 Miscellaneous Items

Fireplace Tongs

Excavated directly in front of the stone forge was a large set of wrought iron fireplace tongs (Plate 6.24). Similar to types that were commonly used throughout the seventeenth and eighteenth centuries these particular fireplace tongs consist of two straight jaws that broadened out immediately below the handle. It was at this location that the two jaws came together to form a hinge. The handle of the tongs is square in cross-section and tapers towards the end at which point there was a large knob. It is likely that this knob would have acted as a counter-balance to offset the weight of the jaws. This particular set of fireplace tongs measures 91.2cm in length and 12.7cm in maximum width. Lindsay states that tongs of this type were made in a variety of sizes (Lindsay 1970: 15).

A drawback commonly associated with this type of tongs is that the hinge is located at the bottom of the handle and therefore left relatively unprotected (Lindsay 1970: 16). Whether or not the tongs excavated from the forge were there to have the hinge repaired is unknown. More likely, since the tongs had one of its tips missing it was probably in the smithy to get a new tip attached.

6.14 Discussion

An analysis of the artifacts excavated from the blacksmith shop indicates that the smiths were involved in a number of different trades including gunsmithing, locksmithing, farriering, and coppersmithing as well as blacksmithing. The fact that rural blacksmiths participated in a number of different trades seems to have been a common feature for those who operated in colonial and frontier settlements. Excavations carried out at colonial and frontier sites such as Pentagoet and Fort St. Joseph all suggest that the local blacksmiths practised a variety of different trades. This would have been very important for the colonists who lived at these isolated settlements since they could have had many of their daily metal-working needs looked after by the local blacksmiths. Imagine the inconvenience a colonist would have had in trying to repair a broken tool or have a number of nails manufactured if there were no blacksmith located nearby! Also, when one considers that the smith would have been able to carry out other functions such as repairing broken gun parts, traps, or mending copper kettles it becomes apparent how important a role he would have had in the community. Consider the blacksmith, James Read, who was a resident at Jamestown in 1607. Read was involved in an altercation with the colony's new president John Ratcliffe, and as a result was sentenced to be hanged. However, after considering the vital role that Read had in the colony Ratcliffe decided to spare his life. As Noel Hume states "killing the man that mends your guns, makes your nails, repairs your chisels, and fixes your locks, not to mention shoes your horses, might not be the wisest of responses" (Noel Hume 1994: 162-163).

An important fact to remember when considering the multi-functional role of the rural blacksmith is that many smiths would not have been specialists in any one particular craft. Rather than manufacturing complex items such as guns and locks it is more realistic to picture the rural blacksmith as someone who would be primarily involved in repairing these types of objects (Wylie 1990: 47). It was the fact that blacksmiths had the ability to mend or repair virtually any type of metal artifact that made them indispensable to their communities (Catts, Hodny, Guttman, and Doms 1994: 9). This notion would have been especially true for an isolated colonial settlement such as Ferryland. Interestingly, when one examines letters written by the Ferryland colonists after the time the forge was in operation one still finds that they are requesting many metal items such as tools and other finished objects be sent over to the colony. This suggests that the smiths were probably more involved in the repair of metal items rather than in their manufacture. In her book *To Draw, Upset, and Weld: The Work of the Pennsylvania Rural Blacksmith, 1742-1935*, Jeanette Lasansky analysed the daily ledgers that belonged to a number of Pennsylvania blacksmiths. She concluded that generally speaking the blacksmith's day-to-day work was rather ordinary and mundane since a majority of the smiths spent their time repairing, forging parts and shoeing horses rather than making exotic or unusual iron objects (Lasansky as in Catts, Hodny, Guttman, and Doms: 1994: 47). After examining both the Pennsylvania blacksmiths and those who worked at Ferryland in the early seventeenth century, it is important to note the similarity between the two in that both groups apparently did not spend much of their time specializing in one particular craft or manufacturing only one specific type of item. As Wylie states "his working world was diversified rather than specialized" (Wylie 1990: 47). Consequently, it seems that rural blacksmiths were more concerned with the working life of the society since a majority of their time was taken up manufacturing and/or repairing items likely associated with the other craftsmen of the settlement (Wylie 1990: 47).

During the initial stages of the colony's development it would have been very advantageous to have an on-site smithy. This early period would have been a time of increased building activity which meant that a variety of tools and building hardware would have had to have been readily available. The smiths would have also repaired many of the tools and items associated with this initial construction phase. Keeping this in mind, it is not surprising to find that the blacksmith shop was one of the first buildings to be constructed at Ferryland. Consequently, soon after the forge was constructed, Captain Wynne asked Calvert to send over a number of skilled tradesmen to assist in the initial building phase. He states "It may likewise please your Honour to give express order, first, that such as be sent hither hereafter may be such men as shall be of good strength, whereof we stand in need of six masons, four carpenters, two or three good quarry men, a slater or two, a lime-burner .... and a convenient number of west-country labourers to fit the ground for the plough" (Pope 1993: 19). The presence of such a large and skilled workforce to come to an isolated area such as Ferryland would have made the role of the blacksmith all the more important.

Wylie states that determining what types of items the smiths would have been involved with depends upon their metal technology and the state of social and economic development in the area (Wylie 1990: 46). Considering this statement it was not unexpected to find that the most common types of objects that the Ferryland smiths were concerned with were those associated with construction, including such items as nails, spikes, hinges, pintles, and eye hooks. Also, it seems that they spent much of their time manufacturing or repairing tools identified with carpentry and agriculture. Even though items such as gun parts, locks, and domestic utensils were recovered from the smithy they seem to have been the exception rather than the norm. This can be explained by a number of particular factors. First, essential items such as tools and building supplies or items that were associated with the working world, would have been given precedence over objects that were not considered necessities. In the colonial society, nails and axes would have been of much greater importance than ornamental gate and door fixtures. Wylie also states that this may be a reflection of cultural values as well as economic practicality when he states "... in a society of limited means, some of the population had ceased to value the artifacts of domestic culture as symbols of respectability" (Wylie 1990: 48). Another factor that would determine the typical objects that the smiths would manufacture would depend upon the location in which they practice their craft. For example, smiths working at locations where fur trading was common would spend much of their time repairing and manufacturing traps while those working at military sites would occupy much of their day creating or repairing guns. Therefore, in the case of the Ferryland smiths one could assume that they spent much of their time fabricating and repairing items associated with the fishery and with farming. However, an interesting point in the case of the Ferryland smiths is that in addition to operating at a rural settlement located in a marine environment they were also working at a colonial settlement that was in its infancy in terms of development.

This meant that items associated with building construction, ground clearing, etc. would have been considered very important. For this reason one can assume that the local blacksmiths generally practised a multitude of tasks ranging from the manufacture and maintenance of tools and building hardware to the repairing of items such as guns and traps. The fact that they worked and lived in an isolated community necessitated that they practice a number of different vocations and consequently create a wide range of items even though some may have been considered more important than others.

Chapter 7

Metallurgic Analysis of Smithy By-Products

7.1 Introduction

During the course of the smithy excavation a large quantity of slag material associated with ironworking was recovered. Uncovering such a vast quantity of slag provided the opportunity to carry out a number of different experiments to try and determine some of the general activities that were attempted by the resident blacksmiths. Interestingly, excavations at the southwestern section of Area C also unearthed a vast amount of slag. Trying to ascertain if this slag originated from the smithy at Area B or from another smithy yet to be discovered was a major focus of this metallurgic study. Henry Unglik, of Parks Canada, conducted a similar type of study from slag recovered from the Fort St. Joseph excavation (Light and Unglik 1984: 93-130). For this research I will try to use his research as a model even though it will be on a much smaller scale as a result of both time and financial constraints.

Determining if the slag excavated at Area C originated from the blacksmith shop involved an examination of some of the artifacts discovered with the slag and a metallurgic analysis of the slag itself. The slag that originated from Area C was found in event 229 in association with a number of other artifacts such as pipes, pottery, brick and roof slates. Pipe fragments from event 229 and event 8 were used to determine if this event dated between 1621-1650 which was likely the period during which the blacksmith shop was in operation (refer to chapter 4). Second, wavelength dispersive X-ray fluorescence (XRF) analysis was done on 46 pieces of slag originating from both the smithy and from Area C. The results obtained from this XRF procedure was also used in determining if the slag from both areas was similar since both should have roughly the same basic composition if they originated from the same smithy. The XRF analysis was conducted by Pam King and Michael Tubrett, staff of the Department of Geology, Memorial University of Newfoundland.

7.2 Analysis of the Artifacts from Event 229

As mentioned in Chapter Four, the artifacts excavated from the smithy suggest that the blacksmith shop likely operated during the first half of the seventeenth century. Therefore if the slag found at Area C is related to that associated with the forge it should follow that the artifacts found with this slag should date to around the same period.

During the excavation of event 229 only 17 pipe stems were recovered. As a result, I felt that a statistical analysis using the Harrington dating method would prove to be unreliable and meaningless (should mention that information concerning event 229 is found in Table 5.7). Interestingly, however, during the excavation of event 8 numerous pipe stems were recovered. Using the Harrington dating method a date range of c.1620-1680 was obtained. This event, which was found to exist throughout much of Area C, seems to be a fill layer which was laid down at this location prior to the construction of a stone storehouse that was built sometime between 1623-1629 (Gaulton 1997: personal communication). The fact that event 229 existed below this particular stratigraphic layer implies that it dates before 1629, possibly to the very early years of the colony of Avalon. Interestingly, if this slag originated from the smithy discovered at Area B this is more evidence suggesting that this blacksmith shop is in fact the same one that was built in 1622 by Captain Edward Wynne and his colonists.

A high proportion of the ceramics excavated from both the forge and event 229 were of the North Devon variety. Event 229 also contained numerous fragments of roof slates similar in form to those excavated from the smithy. Excavation of event 229 also revealed many fragments of brick which may be related to those found on the upper surface of the stone forge.

The two clusters of slag that originated from Areas B and C were found in layers that could be related since both were found to date from around the same time period (i.e. 1620-1650).

7.3 Preliminary Examination of the Slag

In total over 1650 pieces of slag were discovered with approximately 950 and 700 pieces coming from the smithy and the southwestern corner of Area C respectively. From this large sample 46 pieces of slag were chosen for preliminary investigation (30 pieces of slag from Area B and 16 pieces from Area C). In general the slag from both areas came in a variety of sizes with the average piece having dimensions of 9.9cm x 7.7cm x 5.1cm (Plate 7.1). Most pieces of slag were caked-shaped having both a convex base and a concave upper surface (Plate 7.2). Unglik states that slag may have acquired this particular shape from the bowl-shaped forge bottom (Light and Unglik 1984: 97). Similar to Unglik's observations the upper surface of the slag was smooth and glassy whereas the bottom surface was rough. The colour of the slag varied from light to dark grey and brown. Interestingly, some pieces of the slag had fragments of coal embedded into its surface. Analysis of the slag sample have also determined that none of the pieces exhibited any considerable ferromagnetism. Consequently, it can be stated that both clusters of slag have physical characteristics that are consistent with hearth slag, which is the name given to slag that is formed by the accumulation of slag droplets and scale, and other material such as metallic iron, at the base of the smithing hearth (McDonnell 1983: 83).

Unlike the Fort St. Joseph slag that was analysed by Unglik, the Ferryland slag sample did not contain many pieces that could be classified as being contaminated. Contaminated slag, according to Unglik, consists of slagged furnace lining and cinders which has an inhomogeneous structure lacking definite recognizable micro-constituents (Light and Unglik 1984: 97). Consequently, contaminated slag is porous and light in colour and weight as opposed to "true" slag which is dark, heavy and dense (Light and Unglik 1984: 99-100). X-ray fluorescence analysis of the contaminated slag from Fort St. Joseph also found that contaminated slag contained low iron and high silicate concentrations. Using all of the above criteria it was determined that only three of the forty-six Ferryland slag samples fit into this classification, two originating from Area B and one from Area C (Samples 2, 11, and 45). These three samples had an average of 30.64% and 17.63% of both silicate and iron respectively (Tables 7.1 and 7.2). Unglik states that contaminated slag was possibly formed by the "attack of the molten slag on the forge lining" (Light and Unglik 1984: 123). Accordingly, Unglik states that finding a high proportion of contaminated slag suggests an "inadequate state of technology", likely due to the lack of proper maintenance of the forge by the smith. Since forge welding requires a clean fire it is important for the smith to clean out the forge once the fire is dead. Therefore, contaminated slag possibly suggests that this was not being done (Light and

Unglik 1984: 123). Since only three of the Ferryland slag samples fit into the contaminated slag classification it seems that the smiths who operated at Ferryland frequently maintained their forge.

Adding to this idea is only a few of the slag pieces contained any iron objects. The slag from Fort St. Joseph contained many iron objects, some of which were remnants of objects that were lost in the forge. Unglik attributes this high iron object content to the carelessness of the blacksmith (Light and Unglik 1984: 129). Since only one of the slag samples contained an iron object (i.e. possibly a small portion of a nail) it can be suggested that the Ferryland smiths were competent at their work.

7.4 X-ray Fluorescence Spectrometry (XRF) results

To conduct this study 46 slag samples (30 from Area B and 16 from Area C) were analysed for 30 elements (i.e. Na, Mg, Al, Si, P, S, Cl, K, Ca, Sc, Se, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Ga, As, Rb, Sr, Y, Zr, Nb, Ba, Ce, Pb, Th and U) using a Fisons/ARL model 8420 sequential wavelength dispersive x-ray spectrometer. Prior to the XRF analysis all the samples were first prepared as pressed pellets using BRP-5933 Bakelite phenolic resin (Longerich 1995: 1). Unglik conducted a similar type of XRF analysis on slag samples from Fort St. Joseph using standards that were commonly employed for geological samples. In this XRF examination, however, we decided to use an internal standard that was produced using a homogenous mixture of the 46 slag samples. This was done because many of the commercially available standards are based on iron ore deposits and not on the by-products formed from refining the ore, which would be the slag. From the slag mixture (i.e. powder) two pressed pellets were produced and then analysed repeatedly in order to obtain consistent results. Consequently, XRF analysis was performed using both the Ferryland internal standard and an iron ore standard (Lincolnshire Iron Ore deposit - Bureau of Analysed Samples, Ltd. No. 301)(Mathias, Tubrett, and Carter 1997).

The XRF analysis determined there was no significant discrepancies between the slag that originated from the smithy and that found at the southwest corner of Area C (Tables 7.0, 7.1, and 7.2). Initially it seemed that there were significant differences in the amount of copper and zinc found in the two clusters of slag. However, after inspecting the data it became apparent that sample 19 was responsible for skewing the results since it contained amounts of copper and zinc that were well above that found in the other samples. When sample 19 was excluded from the total sample the clusters of slag from both Areas B and C were found to have compositions that were very similar. Consequently, when using the XRF data in conjunction with that obtained through the analysis of the artifacts found in association with the two clusters of slag one can suggest that the Area C slag likely originated from the blacksmith shop located at Area B. No evidence was uncovered that would substantiate the existence of a second blacksmith shop in the Ferryland Pool area.

The XRF analysis also notified us of some interesting features found in the slag samples. For example, copper was found to exist in all the samples with some containing considerably high amounts. Sample 19, for example (which originated from Area B), contained a very high amount of copper when compared to the other samples (27889 ppm). The fact that high amounts of copper were found in some of the slag samples suggests that the smiths were involved in the working of copper or copper alloys (i.e. brazing).

Sample 19 possibly displays evidence of another technique that was employed by the blacksmiths. As mentioned earlier this sample contained very high quantities of both copper and zinc, which together form the basic composition of brass. Consequently, brass or copper alloy fillers were commonly used in a forging technique known as brazing. In his article *Ironworking at an Early Nineteenth Century Blacksmith Shop, Fort St. Joseph, Ontario: An Examination of Iron and Slag,* Unglik gives an excellent description of this process.

He writes:

> "Brazing was generally used to join broken objects that were impossible or very difficult to weld, including cast-iron objects or high carbon steel tools. To braze, the blacksmith placed broken pieces in the forge and heating them to a brazing temperature. Then, placing the fractured surfaces together, he added sand or borax as flux, and applied brass or copper fillings between the two broken iron pieces so that the filler flowed into the whole joint after melting. The brazed piece was left in the dying fire to cool down until the filler solidified. The smith then removed the object from the forge and trimmed off any excess brass or copper." (Light and Unglik 1984: 126-127).

When welding with brass, a much lower heat is used since this reduces the possibility of the pieces becoming distorted. It is this particular quality of the brass which makes this forging technique quite valuable especially when working on finished gun barrels (Faulkner 1987: 149). Faulkner, in his examination of the Pentagoet collection, also found evidence that the resident blacksmiths practised this particular forging technique (Faulkner 1987: 148-149). The fact that sample 19 had such a high concentration of both copper and zinc was likely the result of some molten brass spilling into the forge hearth where it mixed with slag during the process of brazing. Unfortunately, none of the iron artifacts excavated from the smithy displayed any evidence of having been welded using this particular technique.

7.5 Summary

After a close examination of the artifacts excavated from events 154 (Area B) and 229 (Area C) one can state that both stratigraphic layers are likely related. Both events contained slag, brick fragments, roof slates, and similar types of pottery, therefore it seems likely that event 229 was formed after some of the slag originating from the smithy was dumped in this area either before or after the smithy was dismantled. Further evidence that substantiates this claim is XRF analysis, which has determined that slag originating from both of these levels is very similar metallurgically. Consequently, it seems that the slag discovered at southwest corner of Area C originated from the smithy located at Area B.

Examination of the slag has also provided some interesting ideas about the forging practices of the resident blacksmiths. Since few of the slag pieces were "contaminated" it can be suggested that the blacksmiths maintained a clean fire. Also, the fact that only one iron fragment was found in the slag sample demonstrates that the smiths were very competent at their work. In addition, the XRF analysis of the slag provided evidence that seems to suggest that the smiths frequently worked with either copper or copper alloys. Finally, the fact that sample 19 contained high amounts of both copper and zinc demonstrates that the smiths likely practised a forge technique known as brazing.

This type of analysis is extremely valuable since it can reveal a substantial amount of information about the working habits of blacksmiths which could not be found through the examination of artifacts by themselves. Therefore, in the future it would be interesting to conduct further metallurgic analysis on more of the slag in order to discover more information about the working habits of seventeenth-century blacksmiths.

Chapter Eight

Conclusions

8.1 Summary of Results

After analysing the artifacts a number of conclusions can be made regarding blacksmithing in seventeenth-century Ferryland. These conclusions will be briefly discussed in the following section.

A letter written in 1622 by Captain Edward Wynne makes reference to a forge that has recently been constructed. Therefore, the first matter dealt with in this thesis concerned the occupation period of the blacksmith shop and if in fact it was the same forge that was built by Wynne and his men. After an examination of pipe stems, pipe bowls, ceramics and glass fragments that were excavated from the forge it was ascertained that it was likely in use from 1622 to sometime around the mid-seventeenth century. One piece of evidence that points to an early date for smithy construction was a jetton referred to as a Nuremburg counter. This counter, which was recovered from the forge floor, dates from 1580-1610. Pipe stems, recovered from event 154 and level 2B also provided information which added credibility to the idea that the forge was being used from c.1620-1650. The most compelling evidence that suggests that the forge ceased operation around 1650 comes from both the excavated ceramics and the glass artifacts. All the ceramics recovered from the occupational layers had manufacture dates corresponding to the proposed dates that the forge was in operation (c.1622-1650). Consequently, no ceramics types (i.e. combed slipwares and later westerwald stonewares) known to have originated after 1650 were uncovered. An interesting idea pertaining to the glassware was that no shaft-and-globe bottle fragments were discovered from the blacksmith shop. These particular bottles came into vogue around the mid-seventeenth century and soon after became quite common. When one considers this in conjunction with the ceramic evidence it is likely that the forge ceased operation sometime around 1650.

The second matter that was dealt with in this thesis was determining both the interior and exterior features of the smithy. As far as it can be determined it seems that the smithy was constructed primarily from wood which was placed directly into the ground without the use of a sill. Excavations also established that the smithy had a dirt floor and was roofed with slate. Unfortunately, no more evidence pertaining to the structural characteristics of the shop was discovered.

Since the shop was in a remarkable state of preservation it was relatively easy to pinpoint the various interior features of the smithy (Figure 4.2). Interior attributes include such features as the forge, bellows, anvil, and slack tub, in addition to the storage, refuse, and social areas. The forge itself was constructed of stone and measured four by six feet (1.2 by 1.8 metres). Interestingly, an alcove in the forge may have been the place where the slack tub was situated. Immediately south of the stone forge two post holes were discovered which likely represent the location of the bellows. The position of the anvil was determined in a similar manner in that a large post hole, likely left behind when the wooden block supporting the anvil decayed, was located to the east of the stone forge. To the north of the forge a large pile of slag was uncovered which was possibly one of the refuse areas used by the smiths. Finally, by plotting both pipe and ceramic fragments it was hoped that I would be able to identify positively the social area of the shop. However, artifact distributions showed that no area of the forge was used specifically for this purpose. Considering the small size of the shop it would be reasonable to assume that almost all areas of the smithy overlapped with one another.

The principal issue that was addressed in this study was the role of the blacksmith in colonial Ferryland. This type of analysis involved examining all the iron artifacts that were excavated from the smithy in addition to other classes of artifacts such as copper and flint. It seems that most of the implements that were recovered from the smithy were related either to building construction or to land cultivation. Items such as hinges, nails, spikes, eye hooks, staples, axes, mattocks, scythes, and chisels were uncovered in relatively high numbers attest to the notion that the smiths spent a great part of their time manufacturing or repairing these types of objects. During the period that the forge was in use the colony at Ferryland was in the very early stages of its development. When one considers that Calvert may have invested up to £20,000 to £30,000 in the colony, this period would have undoubtedly been a time of increased building construction, land cultivation, and harvesting of local materials such as wood (Pope 1986: 18). This would have necessitated the availability of many of the previously mentioned tools.

An examination of the artifacts also determined that the smiths were practising duties other than blacksmithing such as gunsmithing, coppersmithing, farriering, and locksmithing. This notion seems to have been a common feature for blacksmiths working at isolated communities throughout the seventeenth and eighteenth centuries. As previously mentioned, excavations at other colonial, frontier or rural settlements such as Pentagoet, Fort Vancouver, and Fort St. Joseph all uncovered evidence which depicted the local smith as someone who had a multi-functional role. Consequently, it seems having a blacksmith that was able to manufacture or repair a variety of items other than those normally associated with blacksmithing was a prerequisite for many of these isolated settlements.

The last section of this thesis dealt with the metallurgic analysis of two clusters of smithy slag that were found at the blacksmith shop at Area B and at the southwest corner of Area C. This metallurgic analysis, which was done in conjunction with an examination of some of the excavated artifacts, have determined that both clusters of slag have very similar metallurgic compositions. Consequently, it is highly likely that the Area C slag originated from the blacksmith shop excavated at Area B.

Examination of the slag (both visually and metallurgically) has also provided us with some general ideas about the resident blacksmiths and their forging techniques. Low amounts of "contaminated slag" suggest that the smiths frequently cleaned out the fire bed, whereas low numbers of iron pieces found within the slag imply they were also competent at their work. X-ray fluorescence analysis has also determined that the smiths may have carried out a lot of work dealing with copper or copper alloys. The metallurgic analysis also displayed that the smiths were practising a forging technique known as brazing.

8.2 Conclusion

Until recently, the archaeological study of seventeenth-century Newfoundland remained relatively unexplored. This view is summed up by Pope when he states "...in the context of early British North American colonies... Newfoundland is one of the least intensively studied and most often over-looked by North American scholars" (Pope 1992: 4). During the last decade, however, excavations at Ferryland under the direction of Dr. James Tuck, have rekindled an interest in the early colonial period of Newfoundland history.

One of the most significant archaeological finds uncovered at Ferryland was the discovery of a seventeenth-century blacksmith shop. What made this find so important was that the smithy was in a remarkable state of preservation. As a result this smithy was probably the most complete seventeenth-century colonial blacksmith shop ever excavated. Since very little archaeological information is available regarding seventeenth-century colonial blacksmith shops this study offers us a unique opportunity. Hopefully, this research will be used as a benchmark by other historical archaeologists when studying blacksmith shops and their role in the colonial settlement.

Why is it important to study a blacksmith shop? Perhaps the main reason is that since almost all facets of life were influenced by the smith, a detailed analysis of the forge would give us a better understanding of the overall settlement and how society operated. As Wylie states "The blacksmith was considered the proverbial jack-of-all-trades, a general repairman responsible for almost all of the communities metal-working needs" (Wylie 1990:19). The smith's shop was a place where tools for a number of different trades were made and repaired along with a variety of other iron objects related to all aspects of life. Therefore, a thorough examination of the artifacts excavated at the blacksmith shop used in conjunction with historical documentation and published literature could possibly enable archaeologists to generate a number of general ideas about seventeenth-century society and the role that the smith played in shaping it.

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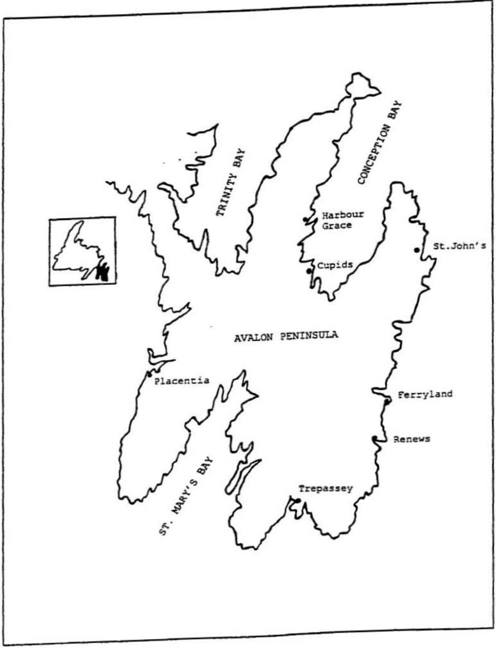
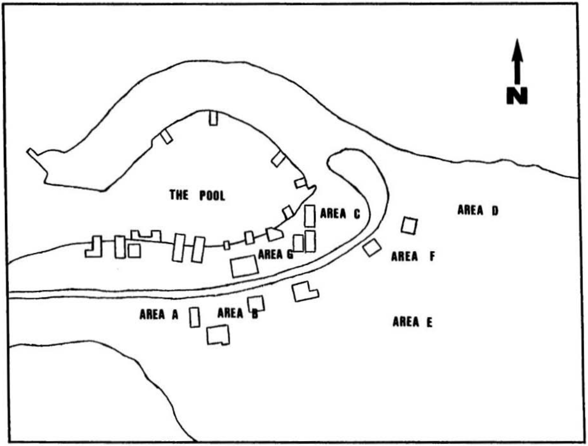


Map 2.1 Map of the Avalon Peninsula.



Map 3.1 **Location of Sites (Areas) A-G, Ferryland, Newfoundland. (Taken from Tuck 1993: 298).**

Plate 3.1 Aerial photograph of Ferryland "Pool".

Plate 4.1 **Archaeological excavation of the blacksmith shop during the '94 field season.**

Plate 4.2 Three roof slates that were excavated from the blacksmith shop.

Plate 4.3 Stone forge (Feature 26).

Plate 4.4 Anvil post molds (Features 28 and 29).

Plate 4.5 Bellows post molds (Features 78 and 79).

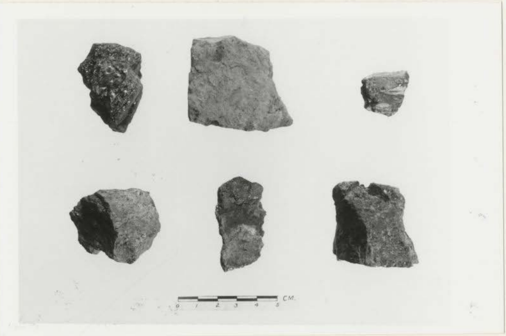


Plate 4.6 Fragments of coal excavated from the forge floor.

Plate 5.1 Pipe bowls excavated from the forge (types A, B, C, D, E, F, G, and H).

Plate 5.2 Pipe bowls excavated from the forge (types I, J, K, L, M, N, and O).

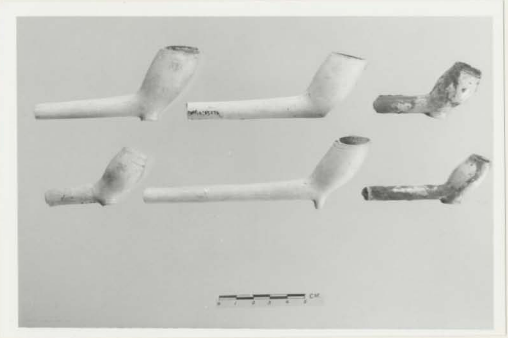


Plate 5.3 Pipe bowls excavated from the forge and stratum 2B (types X, P, Q, R, S, and U).

Plate 5.4 **Nuremburg counter (c. 1580-1610)(21.5mm in diameter).**

Plate 6.1 Iron file excavated from the floor of the blacksmith shop (length 37.7cm).

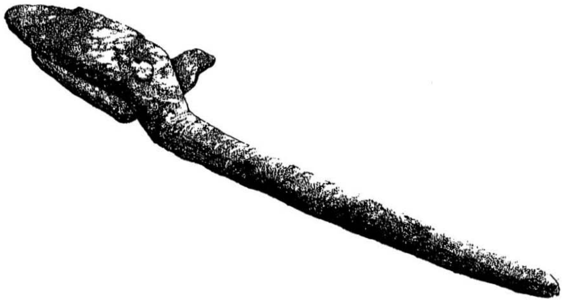


Plate 6.2 Bench shears excavated from the smithy (length 38.8cm).

Plate 6.3 Blacksmith's hand vise (length 14.6cm).

Plate 6.4 Cold chisel fragment and two hand anvils.

Plate 6.5 Blacksmith's nail header (43.0cm in length).

Plate 6.6 Axes.

Plate 6.7 Axe with detached eye.

Plate 6.8 Gimlets that were excavated at Ferryland.

Plate 6.9 Woodworking tools (i.e. forming chisel, plumb bob, caulking wedge, and plane bit).

Plate 6.10 Mattock.

Plate 6.11 Farming tools (i.e. hand scythe and spade).

Plate 6.12 Farrier's tools (i.e. horseshoe, horseshoe nail and clinch cutter).

Plate 6.13 Nails and spikes.

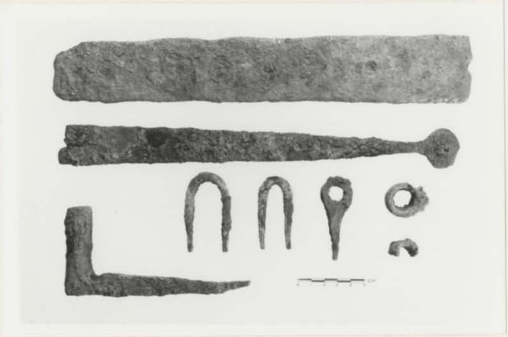


Plate 6.14 Building hardware (i.e. hinges, pintle, staples, and eye bolt).

Plate 6.15 **Furniture and building hardware (i.e. handles and hasp).**

Plate 6.16 Gunsmith's tools and associated items (i.e. frizzen, gun barrel, and reamer).

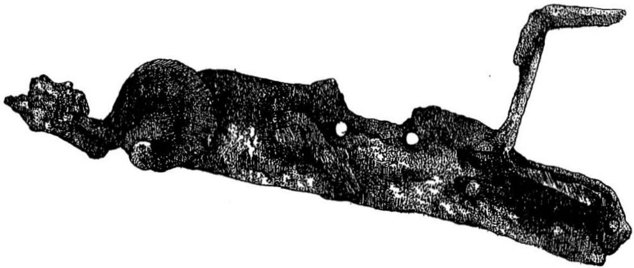


Plate 6.17a Left side of English dog lock excavated from the forge floor (length 17.5cm).

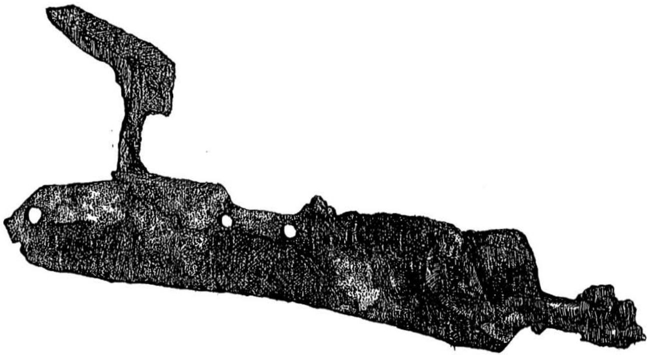


Plate 6.17 b **Right side of English dog lock excavated from the forge floor (length 17.5cm).**

Plate 6.18 Gunflints.

Plate 6.19 Lead shot.

Plate 6.20 Trap jaws and trap spring.

Plate 6.21 Stock lock and keys.

Plate 6.22 Various copper and/or brass artifacts.

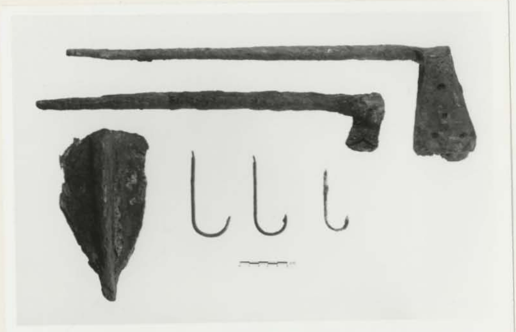


Plate 6.23 Fishing items (i.e. fish prongs, anchor fluke, and fish hooks).

Plate 6.24 Fireplace tongs excavated from the floor of the smithy(length 91.2cm).

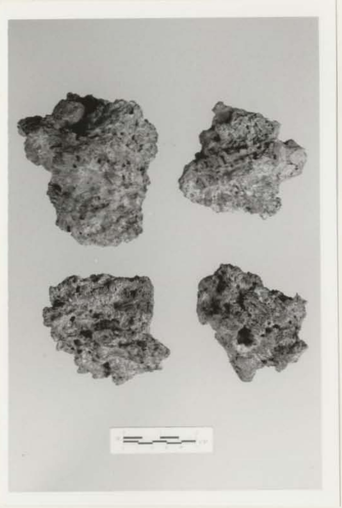


Plate 7.1 Slag excavated from the smithy (Area B) and event 229 (Area C).

Plate 7.2 Caked-shaped slag having a convex base and a concave upper surface.

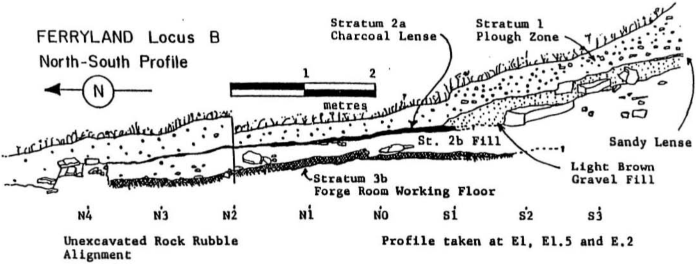
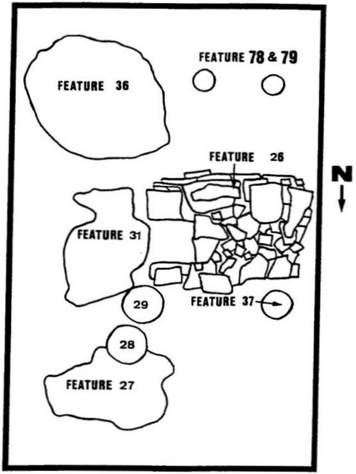


Figure 4.1 **Excavation profile of blacksmith shop (Area B).**
(Taken from Pope 1994, p. 417).



Feature 26 - Stone forge.
Features 27 and 31 - Large concentration of scale, coal, charcoal, and slag located around anvil post molds.
Feature 36 - High concentrations of both coal and charcoal likely representative of the location of the fuel pile.
Features 28 and 29 - Anvil post molds.
Feature 37 - Post mold (possible location of the swage).
Features 78and79- Post molds that likely represent the location of the posts that held the bellows in place.

Figure 4.2 Layout of the blacksmith shop showing location of various features.

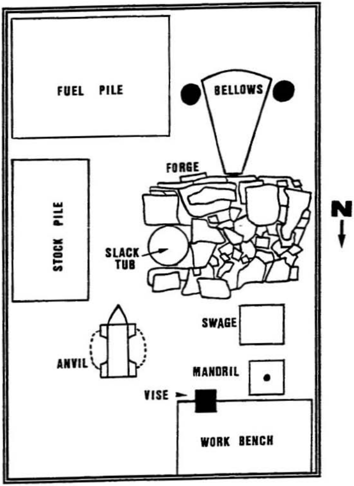


Figure 4.3 Possible layout of blacksmith shop.

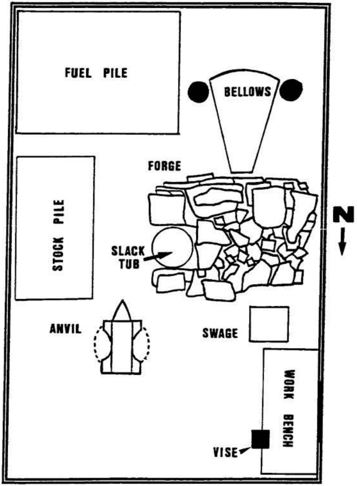


Figure 4.4 Another possible layout of the blacksmith shop.

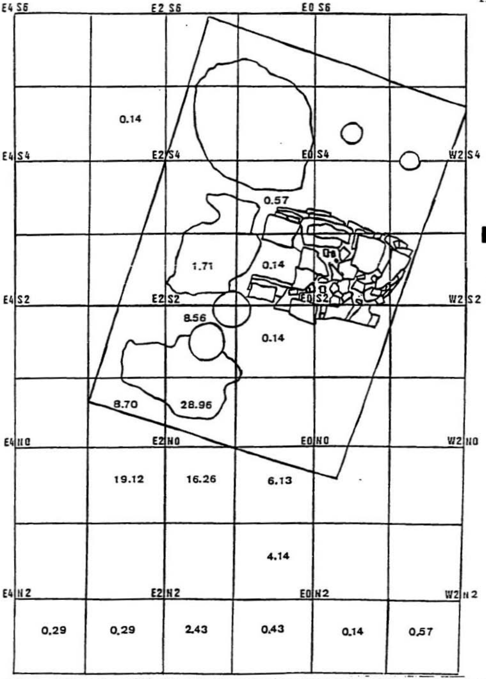


Figure 4.5 **Floor plan of blacksmith shop, showing percentages of slag per unit square (n=701).**

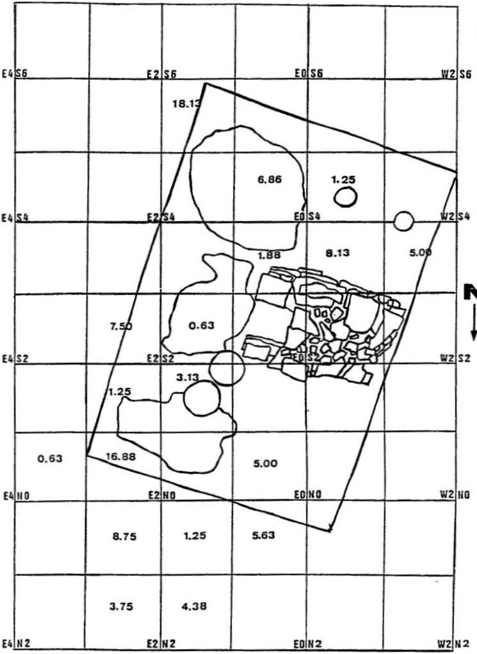


Figure 4.6 **Floor plan of blacksmith shop, showing percentages of copper artifacts per unit square (n=160).**

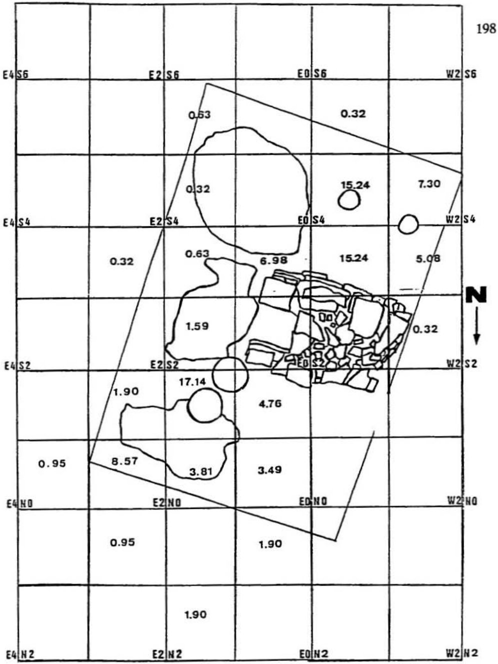


Figure 4.7 **Floor plan of blacksmith shop, showing percentages of case bottle fragments per unit square (n=315).**

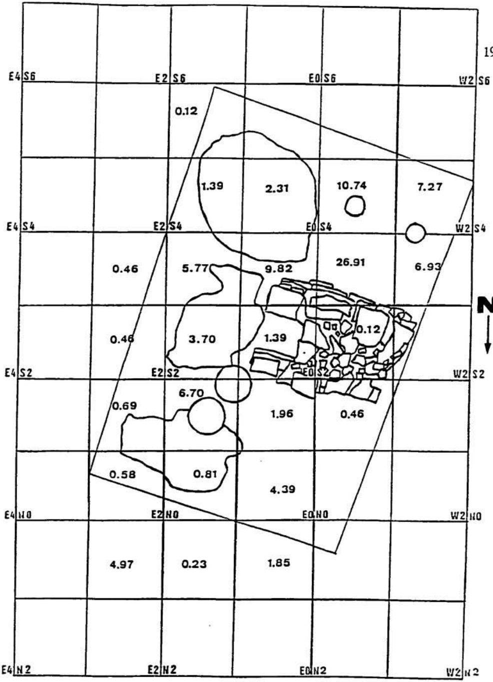


Figure 4.8 **Floor plan of blacksmith shop, showing percentages of pipe fragments per unit square (n=866).**

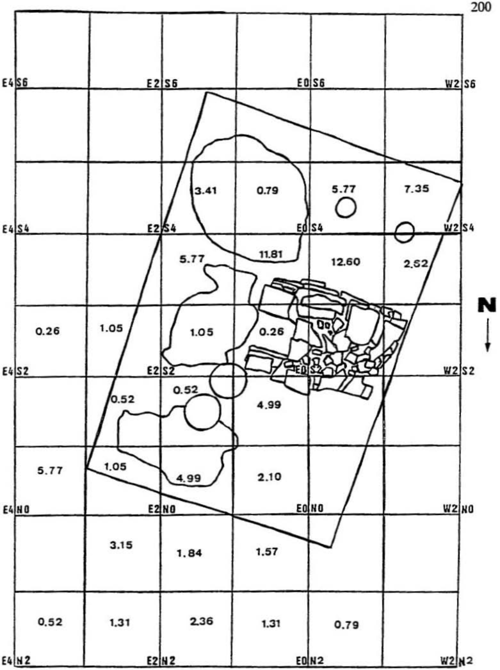


Figure 4.9 Floor plan of blacksmith shop, showing percentages of ceramics per unit square (n=381).

Figure 4.10 Ferryland Area C east 69 profile (10cm=1m).

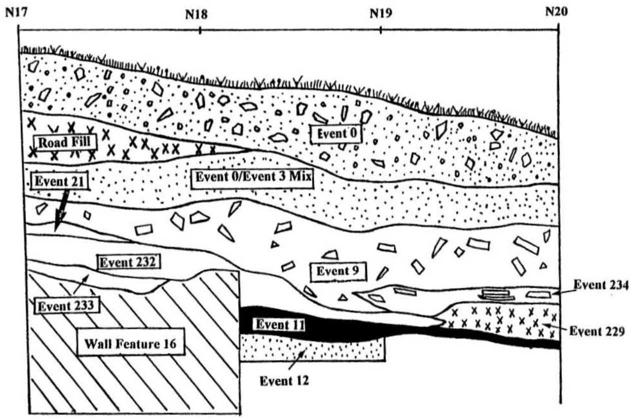


Table 5.1 **Bore diameters and associated mean date of white clay pipestems excavated from event 154.**

Event 154

Stem Bore	Number
4/64	0
5/64	0
6/64	45
7/64	334
8/64	293
9/64	76

TOTAL------------------------------------ 748

Mean pipe stem bore is 7.53476
Mean date for Event 154 is 1644

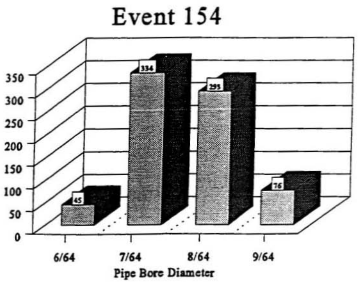


Table 5.2 **Bore diameters and associated mean date of white clay pipestems excavated from stratum 2C.**

Stratum 2C

Stem Bore	Number
4/64	0
5/64	0
6/64	4
7/64	26
8/64	29
9/64	5

TOTAL---------------------------------- 64

Mean pipe stem bore is 7.5469
Mean date for Stratum 2C is 1643

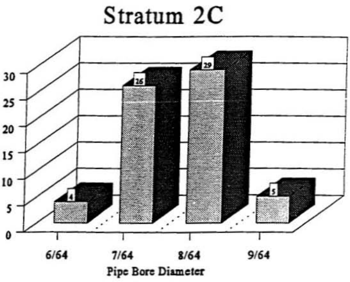


Table 5.3 **Bore diameters and associated mean date of white clay pipestems excavated from stratum 3A.**

Stratum 3A

Stem Bore	Number
4/64	0
5/64	0
6/64	1
7/64	12
8/64	11
9/64	0

TOTAL---------------------------------- 24

Mean pipe stem bore is 7.41667
Mean date for Stratum 3A is 1648

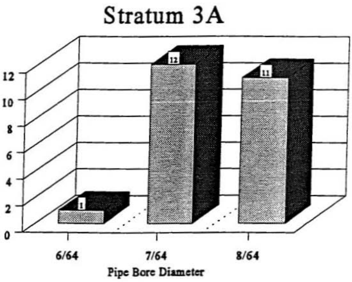


Table 5.4 **Bore diameters and associated mean date of white clay pipestems excavated from stratum 3C.**

Stratum 3C

Stem Bore	Number
4/64	0
5/64	0
6/64	0
7/64	1
8/64	12
9/64	0

TOTAL------------------------------------ 13

Mean pipe stem bore is 7.92308
Mean date for Stratum 3C is 1629

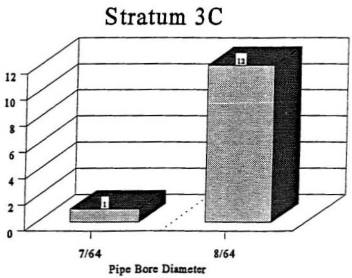


Table 5.5 **Bore diameters and associated mean date of white clay pipestems excavated from event 136.**

Event 136

Stem Bore	Number
4/64	0
5/64	0
6/64	0
7/64	9
8/64	6
9/64	1

TOTAL---------------------------------- 16
Mean pipe stem bore is 7.50000
Mean date for Event 136 is 1645

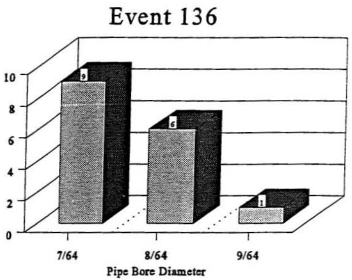


Table 5.6 **Bore diameters and associated mean date of white clay pipestems excavated from stratum 2B.**

Stratum 2B

Stem Bore	Number
4/64	0
5/64	15
6/64	21
7/64	148
8/64	56
9/64	16

TOTAL---------------------------------- 256

Mean pipe stem bore is 7.14453
Mean date for Stratum 2B is 1659

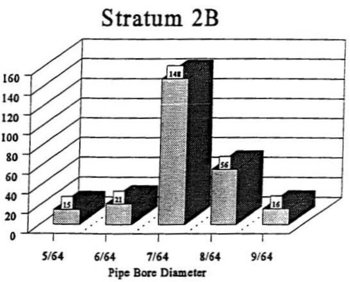


Table 5.7 Bore diameters and associated mean date of white clay pipestems excavated from event 229.

Event 229

Stem Bore	Number
4/64	0
5/64	0
6/64	1
7/64	9
8/64	3
9/64	4

TOTAL------------------------------------ 17

Mean pipe stem bore is 7.58824
Mean date for Event 229 is 1641

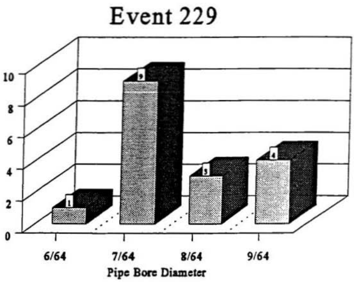


Table 5.8 Percentage of Different Pottery Types Excavated From the Smithy

	Manufacture Date	Number of Fragments	Percentage
North Devon Smooth CEW	1550-1750	320	59.9%
North Devon Gravel CEW	1450-1750	67	12.5%
North Devon Calcareous CEW	1550-1700	11	2.1%
North Devon Sgraffito	1635-1700	4	0.7%
South Somerset Sgraffito	1550-1700	3	0.6%
Totnes	1300-1660	31	5.8%
Merida	1300-1800	33	6.2%
Midlands Purple	1600-1750	5	0.9%
South Somerset	1550-1750	26	4.9%
Southern White	1600-1720	1	0.2%
Bellarmine	1550-1725	18	3.4%
Normandy Brown	1500-1800	1	0.2%
English Tin Glaze	1600-1650	5	0.9%
French Tin Glaze	1630-1690	6	1.1%
Spanish Lustreware	1500-1700	3	0.6%

Manufacture dates for pottery taken from Peter Pope's M.A. thesis "Ceramics From Seventeenth Century Ferryland, Newfoundland (CgAf-2, Locus B)" and Stanley South's "Method and Theory in Historical Archaeology".

Table 6.1

Blacksmith Shop Gunflints (Area B)				
Catalogue #	**Length (mm)**	**Width (mm)**	**Thickness (mm)**	**Colour**
#31824	20.0	27.1	7.4	light grey
#31652	26.5	38.8	11.7	light-dark grey
#126379	25.6	30.6	12.6	light grey
#35780	16.8	28.1	9.5	light-dark grey
#126382	15.9	30.7	5.5	light-dark grey
#35046	23.5	28.7	9.9	light grey
#144624	27.0	23.7	8.5	grey-black
#141190	23.0	29.4	7.4	light brown
#123213	23.3	25.2	10.6	light-dark grey (mottled)
#146557	7.6	23.1	21.1	light-dark grey
Gunflint Median: (complete flints)	24.2	26.8	9.1	

Total Gunflints = 4

Total Gunflint Fragments = 10

Table 7.1 Composition of the Standards used in XRF Analysis

Sample Name	Na2O wt%	MgO wt%	Al2O3 wt%	SiO2 wt%	P2O5 wt%	S (ppm)	Cl (ppm)	K2O wt%	CaO wt%	Sc (ppm)
Lincolns	0.16	1.82	4.31	7.30	0.83	4659.17	421	0.38	23.75	30
Ferryland1	0.81	0.67	9.06	19.75	0.98	9434.81	891	1.66	1.46	17
Ferryland	0.75	0.79	8.81	19.29	0.98	9342.44	880	1.63	1.47	20

Table 7.1 Composition of the Standards used in XRF Analysis

Sample Name	TiO2 wt%	V (ppm)	Cr (ppm)	MnO wt%	Fe2O3T wt%	Ni (ppm)	Cu (ppm)	Zn (ppm)	Ga (ppm)	As (ppm)
Lincolns	0.17	988	193	1.30	34.56	99.11	22.04	153.18	4.96	206.72
Ferryland1	0.34	172	98	0.08	31.91	39.08	182.18	-2.80	7.19	19.59
Ferryland	0.34	169	102	0.08	32.22	31.40	184.49	-5.97	5.08	32.54

Table 7.1 Composition of the Standards used in XRF Analysis

Sample Name	Rb (ppm)	Sr (ppm)	Y (ppm)	Zr (ppm)	Nb (ppm)	Ba (ppm)	Ce (ppm)	Pb (ppm)	Th (ppm)	U (ppm)	Total wt%
Lincolns	14.52	253.81	50.16	93.40	6.29	78.84	204.00	73.03	29.11	0.64	92.35
Ferryland1	87.08	434.51	29.09	141.84	11.55	1649.91	85.98	39.99	15.38	4.26	88.58
Ferryland	87.02	432.77	27.62	131.41	11.50	1671.39	46.61	38.78	15.07	3.56	88.18

Table 7.2 XRF Results of Slag Excavated From Area B

Sample Number	Na2O wt%	MgO wt%	Al2O3 wt%	SiO2 wt%	P2O5 wt%	S (ppm)	Cl (ppm)	K2O wt%	CaO wt%	Sc (ppm)
Sample 1	0.55	0.43	4.99	11.93	1.04	16986.59	1326	0.66	1.32	13
Sample 2	1.23	1.29	14.66	30.00	0.66	6349.3	397	2.53	1.11	20
Sample 3	1.10	0.72	12.72	23.97	1.40	8665.64	613	2.42	1.57	17
Sample 4	1.16	0.58	10.08	22.73	1.01	12197.37	1740	1.76	1.29	16
Sample 5	0.98	1.10	15.39	25.80	0.54	8062.53	262	2.64	0.91	23
Sample 6	0.62	0.23	7.42	17.00	0.93	19173.21	579	1.02	1.30	20
Sample 7	0.29	0.22	3.05	9.06	0.97	9780.85	1412	0.34	0.58	15
Sample 8	0.72	0.73	7.12	16.53	1.29	12550.54	755	0.95	2.61	13
Sample 9	0.77	0.49	9.21	19.95	0.91	10322.49	1033	1.98	1.23	21
Sample 10	0.70	0.33	7.89	15.64	0.89	7860.13	942	1.63	0.95	13
Sample 11	1.34	1.54	13.90	30.84	0.60	5456.86	339	2.47	1.09	19
Sample 12	0.32	0.12	3.69	8.16	1.22	8079.17	636	0.70	0.40	6
Sample 13	0.60	0.27	6.65	13.71	1.03	13595.29	2008	1.41	0.93	14
Sample 14	0.65	0.44	10.66	17.12	1.29	10982.20	762	1.65	1.03	20
Sample 15	0.92	0.65	11.13	22.88	0.67	8607.52	1886	2.26	0.97	12
Sample 16	0.32	0.17	6.22	12.76	1.26	9054.47	980	0.68	0.81	12
Sample 17	0.57	0.55	8.56	17.40	0.96	11531.38	1299	1.66	0.74	6
Sample 18	0.70	0.38	9.26	23.35	0.59	9775.84	724	1.89	0.78	14
Sample 19	1.20	2.05	13.82	22.70	0.70	7148.82	5392	2.01	3.63	38
Sample 20	0.65	0.48	7.51	16.42	1.55	10311.77	493	1.40	0.75	1
Sample 21	0.71	0.36	8.18	16.59	0.83	12212.33	610	1.64	1.34	12
Sample 22	0.78	0.34	8.55	18.44	0.47	10027.5	1091	1.37	1.20	17
Sample 23	0.87	0.56	7.90	20.07	1.21	9145.49	845	1.53	1.13	9
Sample 24	0.38	0.16	4.77	9.24	1.08	8621.11	1827	0.58	0.72	12
Sample 25	0.49	0.21	5.21	11.55	1.43	6585.37	885	0.84	0.90	7
Sample 26	0.97	1.02	10.39	31.07	0.60	8036.46	228	2.01	3.58	19
Sample 27	0.45	0.27	8.03	17.22	1.22	25893.61	1096	1.51	0.68	19
Sample 28	1.07	0.96	12.05	33.79	0.51	6709.08	140	2.11	3.92	14
Sample 29	1.08	0.74	13.38	23.14	0.82	6025.83	664	2.33	1.25	27
Sample 30	0.88	0.77	7.85	22.48	1.04	5208	1682	1.29	2.38	13
Mean	0.77	0.61	9.01	19.38	0.96	10165.23	1088.20	1.58	1.37	15.4
L.D.	0.010	0.11	0.008	0.011	0.003	12	25	0.003	0.003	9

Table 7.2 XRF Results of Slag Excavated From Area B (continued)

Sample Number	TiO2 wt%	V (ppm)	Cr (ppm)	MnO wt%	Fe2O3T wt%	Ni (ppm)	Cu (ppm)	Zn (ppm)	Ga (ppm)	As (ppm)
Sample 1	0.19	87	42	0.20	48.75	21.58	200.72	7.04	0.25	37.92
Sample 2	0.50	168	131	0.08	20.77	39.83	70.50	-18.64	4.53	23.47
Sample 3	0.42	201	129	0.08	24.56	23.72	128.83	-10.84	3.21	21.39
Sample 4	0.40	373	90	0.09	29.15	39.12	187.75	6.04	12.73	29.17
Sample 5	0.47	182	144	0.06	21.39	50.91	83.03	-21.16	3.04	8.50
Sample 6	0.39	337	108	0.04	36.16	54.44	165.45	-0.59	8.52	39.37
Sample 7	0.17	81	48	0.09	54.74	87.65	258.02	-3.17	11.71	95.34
Sample 8	0.29	119	74	0.23	39.58	36.54	185.93	-8.16	6.52	30.96
Sample 9	0.37	155	123	0.06	31.14	18.92	210.36	-16.55	4.96	31.35
Sample 10	0.29	132	84	0.05	41.29	16.14	178.52	-26.27	5.96	26.20
Sample 11	0.48	160	112	0.11	17.94	28.64	55.25	-15.23	1.88	11.60
Sample 12	0.16	67	32	0.10	52.81	9.81	411.84	0.20	4.85	60.48
Sample 13	0.28	133	98	0.09	37.83	37.78	133.40	6.29	7.19	8.63
Sample 14	0.38	234	124	0.07	31.44	39.37	199.05	24.80	11.54	20.44
Sample 15	0.38	159	116	0.04	26.67	20.92	171.69	-7.85	6.27	23.32
Sample 16	0.30	280	85	0.06	43.21	87.80	427.23	54.93	13.90	20.63
Sample 17	0.35	122	106	0.06	34.49	17.29	91.06	-15.78	3.04	38.20
Sample 18	0.37	437	161	0.05	25.04	74.03	247.31	8.20	14.91	7.99
Sample 19	0.52	199	150	0.14	14.98	79.37	27889.92	1101.08	18.48	140.48
Sample 20	0.28	225	74	0.07	39.28	53.83	514.92	8.11	13.95	40.38
Sample 21	0.30	151	86	0.07	37.46	20.51	169.40	-8.31	8.54	8.00
Sample 22	0.36	202	104	0.05	35.65	22.74	207.82	-16.96	4.90	12.27
Sample 23	0.33	111	96	0.12	30.22	22.74	207.82	23.06	12.58	40.29
Sample 24	0.21	86	61	0.12	49.01	44.41	320.46	-8.43	5.05	30.89
Sample 25	0.21	101	76	0.04	43.43	11.03	150.35	50.63	13.44	19.91
Sample 26	0.37	196	93	0.05	18.75	49.34	153.39	35.33	7.59	21.21
Sample 27	0.35	412	116	0.03	34.98	73.54	279.97	7.38	13.65	37.23
Sample 28	0.39	195	111	0.04	15.27	47.65	135.99	0.00	6.28	20.03
Sample 29	0.42	188	144	0.06	25.34	37.80	106.38	0.00	5.92	24.85
Sample 30	0.44	139	102	0.20	48.23	15.32	138.34	7.53	4.90	23.91
Mean	0.35	187.73	100.67	0.085	33.65	39.43	1122.69	44.69	8.01	31.81
L.D.	0.004	6	8	0.002	0.006	6	4	4	3	16

Table 7.2 XRF Results of Slag Excavated From Area B (continued)

Sample Number	Rb (ppm)	Sr (ppm)	Y (ppm)	Zr (ppm)	Nb (ppm)	Ba (ppm)	Ce (ppm)	Pb (ppm)	Th (ppm)	U (ppm)	Total wt%
Sample 1	28.12	351.39	17.79	73.33	7.37	2065.99	-2.10	20.71	7.97	4.77	96.48
Sample 2	130.06	383.30	29.62	172.78	16.19	1641.74	82.63	308.54	14.30	5.72	94.07
Sample 3	121.47	715.16	33.03	152.75	13.25	2772.92	150.04	13.52	15.74	5.01	89.68
Sample 4	79.08	184.76	31.14	178.03	12.83	607.34	75.28	23.68	12.91	7.11	90.64
Sample 5	137.43	380.47	30.27	154.77	15.24	1767.22	119.30	12.67	17.59	4.76	89.30
Sample 6	43.45	253.95	37.24	147.16	15.69	765.97	83.89	21.93	14.32	5.40	88.82
Sample 7	15.95	167.41	10.13	63.97	6.79	1392.60	36.75	25.55	7.93	-1.01	95.97
Sample 8	43.17	603.87	25.41	116.47	10.97	2610.61	21.72	43.12	10.24	3.78	94.18
Sample 9	1110.60	498.29	27.40	153.66	12.13	1955.13	59.94	18.75	14.51	3.77	87.94
Sample 10	83.88	443.11	23.81	111.59	10.55	1770.71	52.71	20.30	12.47	6.29	93.29
Sample 11	119.83	303.83	28.39	168.11	15.13	1574.92	116.76	10.35	13.71	4.73	90.61
Sample 12	34.86	87.19	9.40	49.70	4.94	1034.27	45.58	47.58	7.53	-0.18	92.64
Sample 13	73.37	343.52	19.98	107.00	9.45	1707.92	69.67	21.94	8.95	1.02	85.79
Sample 14	99.37	306.45	32.92	145.23	13.95	1467.85	125.85	38.60	18.52	7.20	86.18
Sample 15	121.52	401.52	26.67	163.59	12.60	1729.54	99.84	30.32	11.11	3.79	88.38
Sample 16	33.81	94.48	23.72	117.25	14.53	544.08	70.42	31.34	8.75	4.33	89.62
Sample 17	95.26	281.47	21.94	125.97	13.07	1444.31	78.85	20.73	11.68	2.93	88.19
Sample 18	95.17	223.59	48.38	179.55	16.33	1836.55	148.53	197.36	12.20	10.74	83.92
Sample 19	110.22	487.78	34.85	144.99	14.63	2206.06	125.14	542.11	12.83	2.49	82.95
Sample 20	67.44	239.44	23.99	108.09	10.11	770.34	25.29	26.13	7.47	9.18	92.32
Sample 21	92.90	315.22	30.38	128.35	10.46	1334.34	102.15	21.64	13.89	2.49	91.17
Sample 22	71.11	351.00	31.01	161.92	13.43	1334.57	40.24	16.52	12.45	6.40	90.75
Sample 23	74.85	258.40	20.94	123.92	10.76	1085.91	63.72	28.54	10.34	3.09	85.79
Sample 24	27.43	281.89	25.11	78.77	7.85	698.56	65.90	28.48	5.21	8.13	90.87
Sample 25	41.85	259.41	18.18	87.52	8.14	1106.98	34.72	88.86	8.28	4.74	87.01
Sample 26	96.68	865.73	33.65	163.61	14.09	1855.21	62.83	30.20	12.22	5.75	90.86
Sample 27	76.83	301.48	42.82	164.36	14.47	1660.14	89.41	48.29	11.27	13.28	89.83
Sample 28	102.74	1012.10	33.01	158.94	13.79	1934.59	75.11	25.30	17.24	3.94	91.79
Sample 29	124.62	532.13	31.62	163.61	13.40	2306.67	110.84	15.99	18.02	5.45	89.55
Sample 30	65.14	610.84	30.65	123.32	11.46	2808.50	92.42	17.44	11.50	-1.23	87.53
Mean	113.94	384.64	27.78	132.94	12.12	1593.05	77.52	59.88	12.04	4.88	89.87
L.D.	0.8	1.4	0.8	1.3	0.8	29	48	4	3	4	n/a

Table 7.3 XRF Results of Slag Excavated From Area C

Sample Number	Na2O wt%	MgO wt%	Al2O3 wt%	SiO2 wt%	P2O5 wt%	S (ppm)	Cl (ppm)	K2O wt%	CaO wt%	Sc (ppm)
Sample 31	1.47	1.42	16.83	26.79	0.72	3516.45	274	2.73	1.11	27
Sample 32	0.90	0.57	10.94	22.15	1.07	7399.31	840	2.13	1.25	12
Sample 33	0.77	0.29	7.53	15.95	0.77	10063.39	1088	1.57	1.60	10
Sample 34	0.71	0.28	7.40	14.94	0.71	10084.78	879	1.39	0.81	16
Sample 35	0.58	0.46	9.28	15.92	1.42	8600.73	556	1.76	0.86	14
Sample 36	0.49	0.27	6.06	14.19	0.85	7367.88	1714	1.17	0.74	8
Sample 37	1.03	0.43	8.64	16.07	1.19	9109.49	893	1.40	1.21	11
Sample 38	0.80	0.66	11.85	24.23	1.29	10277.81	280	2.27	1.24	19
Sample 39	1.27	1.01	10.34	23.68	1.04	5129.06	653	1.94	1.12	7
Sample 40	0.94	0.49	9.91	20.82	0.98	6853.75	1064	2.15	1.12	8
Sample 41	0.44	0.19	5.35	10.91	1.26	8482.54	1702	1.19	0.84	16
Sample 42	1.01	0.68	10.60	22.46	0.75	6980.77	379	2.19	1.20	16
Sample 43	0.94	0.61	11.49	24.01	1.11	6596.37	428	2.09	1.06	13
Sample 44	0.37	0.26	9.19	16.86	1.10	19425.06	679	1.79	0.56	20
Sample 45	0.67	0.95	20.15	31.09	0.44	7215.14	161	2.09	0.69	35
Sample 46	2.00	1.19	14.65	29.11	0.86	4357.35	375	2.21	2.12	16
Mean	0.90	0.61	10.64	20.57	0.97	8216.24	747.81	1.88	1.10	15.5
L.D.	0.010	0.11	0.008	0.011	0.003	12	25	0.003	0.003	9

Table 7.3 XRF Results of Slag Excavated From Area C (continued)

Sample Number	TiO2 wt%	V (ppm)	Cr (ppm)	MnO wt%	Fe2O3T wt%	Ni (ppm)	Cu (ppm)	Zn (ppm)	Ga (ppm)	As (ppm)
Sample 31	0.44	206	156	0.24	19.95	61.63	93.69	-9.22	9.67	22.06
Sample 32	0.39	171	124	0.05	29.09	39.64	146.43	-21.35	8.40	18.30
Sample 33	0.29	117	74	0.05	39.34	29.99	144.87	-15.06	7.02	37.31
Sample 34	0.26	122	71	0.07	44.68	5.05	138.71	-23.60	4.61	24.90
Sample 35	0.36	155	106	0.04	31.64	20.41	221.04	10.85	1.36	79.95
Sample 36	0.23	105	75	0.05	42.54	17.03	235.75	-8.00	5.79	25.04
Sample 37	0.28	116	78	0.05	37.63	32.28	160.10	4.11	7.41	22.55
Sample 38	0.40	163	128	0.05	23.17	19.25	96.85	-2.66	5.85	16.96
Sample 39	0.39	130	89	0.06	28.05	29.65	266.91	17.32	10.56	10.81
Sample 40	0.36	152	126	0.10	30.08	15.42	151.97	-21.07	9.66	12.20
Sample 41	0.24	108	80	0.04	41.53	22.78	185.48	15.31	6.23	35.47
Sample 42	0.40	170	131	0.06	26.33	6.90	235.39	-22.48	5.17	18.37
Sample 43	0.36	156	120	0.04	28.37	32.64	202.17	-10.70	7.97	44.29
Sample 44	0.41	493	118	0.04	31.87	38.02	141.84	4.61	11.97	40.69
Sample 45	0.72	776	202	0.03	14.19	94.26	227.65	-22.54	13.27	24.56
Sample 46	0.47	176	123	0.14	18.37	41.25	85.73	-6.94	7.09	1.73
Mean	0.38	207.25	112.56	0.07	30.43	31.64	170.91	3.26	7.63	27.20
L.D.	0.004	6	8	0.002	0.006	6	4	4	3	16

Table 7.3 XRF Results of Slag Excavated From Area C (continued)

Sample Number	Rb (ppm)	Sr (ppm)	Y (ppm)	Zr (ppm)	Nb (ppm)	Ba (ppm)	Ce (ppm)	Pb (ppm)	Th (ppm)	U (ppm)	Total wt%
Sample 31	141.43	268.58	38.18	138.34	13.02	1381.09	105.48	15.95	18.07	3.90	90.91
Sample 32	113.28	513.70	29.36	161.31	13.21	2137.02	96.19	16.07	13.97	5.00	90.04
Sample 33	82.98	402.37	23.58	122.51	10.99	1651.69	31.45	19.45	12.38	3.94	91.49
Sample 34	65.69	335.60	20.07	95.10	9.04	1437.42	48.74	30.76	11.33	-0.05	96.16
Sample 35	103.68	364.57	22.14	123.98	10.20	1717.08	85.28	27.63	12.44	7.90	82.97
Sample 36	62.82	271.53	16.43	85.49	7.93	1283.24	38.60	25.05	9.92	4.34	90.60
Sample 37	69.42	317.37	20.35	95.33	8.98	1370.14	110.74	38.25	11.21	5.21	91.89
Sample 38	119.00	462.89	28.72	168.04	12.89	1993.44	92.65	36.84	13.74	6.38	87.02
Sample 39	93.90	362.28	24.22	150.05	13.05	1485.46	71.87	37.59	14.05	4.46	90.91
Sample 40	109.42	403.03	23.94	139.03	11.90	1650.72	54.62	18.72	15.34	7.68	88.13
Sample 41	66.38	321.81	17.57	89.53	8.54	1571.01	50.73	35.90	12.19	4.46	84.43
Sample 42	114.37	456.24	29.10	157.21	13.41	1969.05	115.63	15.15	14.35	3.90	86.06
Sample 43	112.19	432.98	25.50	135.75	11.90	1720.20	86.46	22.56	13.10	4.30	91.67
Sample 44	93.75	196.39	37.11	135.13	14.04	609.56	118.39	17.05	11.87	13.34	84.53
Sample 45	97.51	219.27	69.19	257.68	23.32	674.44	194.49	28.27	20.55	15.02	89.95
Sample 46	106.69	566.16	33.91	182.46	13.82	2348.54	84.98	15.71	19.39	3.90	90.61
Mean	97.03	368.42	28.71	139.81	12.27	1562.51	86.64	25.06	14.00	5.86	89.21
L.D.	0.8	1.4	0.8	1.3	0.8	29	48	4	3	4	n/a

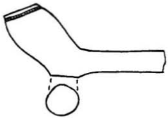
Appendix 1

Clay Pipe Typology

Type A (1610-1640)

Four pipe bowls of this form were excavated at the smithy. It is quite possible that these pipe bowls represent the earliest occupation of the blacksmith shop. Pope states that this type is very similar to some of those that were manufactured in London (Pope 1988: 32). Characteristics of this particular type are:

- flat slightly elevated round base
- small bowl that is slightly tilted forward
- milling around the upper portion of the bowl.



Type B (1620-1660)

Excavations uncovered two pipe bowls of this particular type (E 154). These bowls have traits which make them comparable to those that were being made in either Bristol or in the South during this period (Pope 1988: 32). Characteristics of this type are:

- flat elevated round base
- small elongated overhanging bowl
- milling around the upper portion of the bowl

Type C (1620-1660)

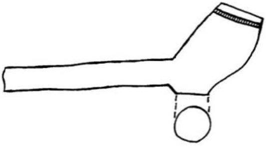
Excavations of the smithy has unearthed seven pipe bowls of this type (six from E 154 and one from Stratum 3A). Pope states that this type was similar to those being manufactured in Bristol, London, or the South during this period (Pope 1988: 32). Faulkner, however, claims that these pipe bowls originated from Exeter (Faulkner 1997: personal communication). Characteristics of this type are:

- flat elevated round base (one bowl has a base that is more oval in shape than round)
- forward projecting small bowl
- milling around the upper portion of the bowl

Type D (1620-1650)

Seven pipe bowls of this form were excavated at the smithy (E 154). These types are comparable to those of either London, Bristol, or Dutch manufacture (Pope 1988: 32). Characteristics of this type are:

- large flat elevated round base (one base is slightly smaller than the others)
- small bowl that is slightly tilted forward
- milling around the upper portion of the bowl
- one base has the initials EI



Type E (1635-1665)

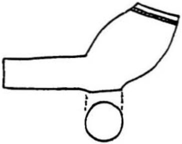
This was the most common type of pipe bowl excavated (n=24) from the blacksmith shop (twenty three from event 154 and one from stratum 2B). These pipes are similar to those being manufactured at Plymouth during this period (Pope 1988: 32). Characteristics of this type are:

- flat round elevated base (in some cases the base was either slightly drooping forward, elevated perpendicular to the stem or in line with the stem)
- bowl is slightly tilted forward
- milling around the upper portion of the bowl

Type F (1630-1660)

Excavations unearthed seven pipe bowls of this type (event 154). This type is comparable to forms that were being made in Exeter at that time (Pope 1988: 32). Characteristics of this type are:

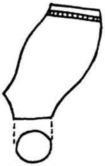
- slightly elevated large flat base
- bowl is slightly tilted forward
- milling around the upper portion of the bowl



Type G (1640-1680)

Two of these Exeter type pipe bowls were excavated from the forge floor (Pope 1988: 32). Characteristics of this type are:

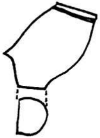
- flat round base that is in line with the stem
- bowl is slightly tilted forward
- milling around the upper portion of the bowl



Type H (1640-1670)

Excavations of the forge floor uncovered two pipe bowls of this type. These pipe bowls were similar to being manufactured at Exeter during this period (Pope 1988: 32). Characteristics of this particular type are:

- large flat round base that is in line with the stem
- small bowl that is slightly tilted forward
- milling is found on the upper portion of the bowl



Type I (1640-1670)*

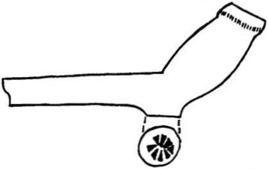
Three pipe bowls of this type were excavated at the smithy. These pipe bowls were likely manufactured in either Bristol or the South (Pope 1988: 32). Faulkner, however, claims that these pipe bowls originated from Exeter (Faulkner 1997: personal communication). Characteristics of this particular type are:

- elevated flat round base
- forward projecting small bowl
- no milling on the upper portion of the bowl
- Maker's mark on the heel has the initials I.H. or H.I.

Type J (1650-1680)

Five pipe bowls of this particular type were discovered during excavations. Pope states that these pipe bowls are very similar to types that were being manufactured in Exeter at this time (Pope 1988: 32). Characteristics of these Exeter type pipe bowls are:

- large elevated flat round base
- forward projecting bowl
- milling found on upper portion of the bowl
- Maker's mark on the heel in the shape of a rosette



Type K (1650-1690)

Excavations uncovered five pipe bowls of this variety. It is possible that these pipes were manufactured in Bristol (Pope 1988: 32). Characteristics of these specific pipe bowls are:

- large elevated flat round base
- forward projecting bowl is slightly larger than other types previously described
- milling found on the upper portion of the bowl

Type L (1650-1680)

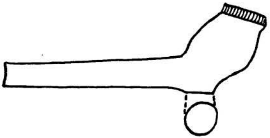
Two types of this particular bowl form were unearthed from the smithy floor. Pope interpreted this form as being similar to those being manufactured at Exeter in the second half of the seventeenth century (Pope 1988: 32). Characteristics of this pipe bowl form are:

- large flat round base that is in line with the stem (the base of one pipe bowl is more oval in shape than round)
- forward projecting bowl
- milling found on upper portion of the bowl

Type M (1630-1650)

Three pipe bowls of this type were discovered during excavations of the smithy. It is possible that this type was manufactured at Bristol during this period (Pope 1988: 32). Characteristics of this bowl form are:

- slightly elevated round base
- small slightly projecting bowl
- milling was found on the upper portion of the bowl



Type N (1640-1660)*

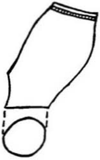
Excavations of the blacksmith shop have uncovered two clay pipes of this variety. Pope states that this type is of London manufacture (Pope 1988: 32). Characteristics of this bowl form are:

- small spur found at base of bowl
- small slightly projecting bowl
- milling was found on the upper portion of the bowl (both rouletted and grooved types were found)

Type O (1640-1665)

One type of this particular bowl form was found during the excavation of the smithy. It is possible that this form was produced in London during the mid-seventeenth century. Characteristics of the type O pipe bowl are:

- round or slightly oval base
- base could be either in line with the stem or slightly drooping forward
- bowl that slightly projects forward
- milling was found on the upper portion of the bowl (rouletting)



Type P (1660-1710)

Ten of these pipe bowls were found during the course of the excavation in stratum 2B (stratum 2B is a layer found overlying the blacksmith shop but seems to be related to a late seventeenth-century domestic structure that is located to the north of the forge). These pipe bowls are of a form that was being manufactured in Barnstaple during the second half of the seventeenth century (Pope 1988: 32). Faulkner, however, claims that these pipe bowls originated from Exeter (Faulkner 1997: personal communication). Features of this particular bowl type are:

- small elevated oval shaped base
- large slightly forward projecting bowl
- milling is found on the upper portion of the bowl (rouletting)

Type Q (1660-1710)

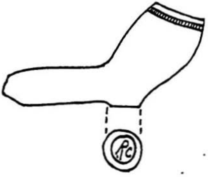
Excavation of stratum 2B unearthed five pipe bowls of this particular type (stratum 2B is a layer found overlying the blacksmith shop but seems to be related to a late seventeenth-century domestic structure that is located to the north of the forge). This form was possibly produced in either London or Bristol (Pope 1988: 32). Attributes of type are:

- no heel or spur was present
- large slightly forward projecting bowl
- milling is found on the upper portion of the bowl (rouletting)

Type R (1640-1670)

Five pipe bowls of this type were recovered during the excavations. These pipe bowls were possibly manufactured in either London or Bristol (Pope 1988:32). Characteristics of type R pipe bowls are:

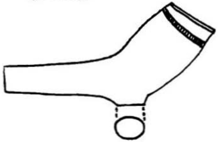
- slightly elevated flat round bases
- forward projecting bowls
- milling found on upper portion of the bowl (rouletting and grooving)
- Maker's mark with the initials R.C. found on heel



Type S (1640-1680)

Excavations of the smithy uncovered two pipe bowls of this form. It is possible that this type was produced in Exeter (Pope 1988: 32). Characteristics of this type are:

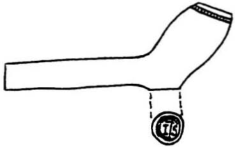
- small elevated oval base
- slightly forward projecting bowl
- milling found on upper portion of the bowl (rouletting and grooving)



Type U (1630-1660)

Excavations unearthed one pipe bowl of this type. This form looks comparable to those manufactured in London during this period. Features of this particular pipe bowl are:

- flat round slightly elevated base
- small, narrow pipe bowl that slightly projects forward
- milling is present on the upper portion of the bowl (rouletting)
- Maker's mark on the heel has the initials I.S.



To view clay pipes with bowl shapes and maker's marks similar to those that have been previously described one should also refer to Atkinson and Oswald (1969 and 1972), Eric Atyo (1979), D.H. Duco (1981), A. Grant and D. Jemmett (1985), James Bradley and Gordon DeAngelo (1981), Oswald (1960 and 1969), Ulysses Pernambucano de Mello (1983) and Iain Walker (1977).