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CONTENTS

Theory and Method in the Analysis of Human Skeletal Material: Problems in Both Old World and New World Studies

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Abstract

Not only the health status and physical appearance of ancient peoples can be determined through a study of their skeletal remains. Osteological data, in conjunction with the archaeological record, can provide substantial information on ancient cultures, including insights into social structure. In this paper, modern theory in human osteology is summarized from historical and philosophical perspectives, demonstrating how conceptual attitudes influenced data gathering and analysis. The needs of modern studies and potential results of careful inquiry are reviewed. The importance of these studies in providing a better understanding of the actual people who were the bearers of the cultural systems which archaeologists attempt to reconstruct cannot be underestimated.

Introduction

A solid data base remains essential for scientific analysis in every discipline. The sophisticated techniques of analysis associated with modern scholarship depend for their accuracy upon the quality of the primary observations with which the analysis are concerned. Failures at the foundation level cannot be overcome by the most complex computer programs or brilliant minds of concerned scholars. Rigorous and disciplined observation, therefore, stands as a basic tenet of scholarship.

Less often considered, but even more important to scholarly progress, is the matter of scholarly theory or philosophy which directs the pattern by which students in a discipline proceed to gather and process information. This paper will attempt to deal with the delicate balance which has existed between traditional and modern theory in physical anthropology and the effects of these theories on the way in which the discipline is approached. The results of various studies derive from the kinds of questions which are asked. In turn, these questions are formulated on the basis of theories regarding what the physical anthropologist believes can be told about people of the past by studying their skeletal remains.

Goals of Modern Studies of Human Skeletal Populations

Contemporary physical anthropologists analyzing human skeletal populations from archaeological contexts have a vast number of goals in mind when beginning any particular study. A brief summary of procedures and considerations may enable scholars unfamiliar with this specialized area of study to grasp the intent of such research and the means by which these goals may best be achieved. The development of an awareness in these matters enables excavators encountering cemetaries, ossuaries, or even random skeletal material to understand the mechanisms by which this category of "artifacts" might best be handled.

The first steps in the analysis of human skeletal material are to determine (1) if the material in question is bone or tooth, and (2) to separate the human material from animal, or non-human remains. This activity requires a specialist, and no amount of inference or speculation provides answers to this basically technical problem. The assumption that human skeletal material derives solely from tombs, graves, or other "mortuary contexts" is false, and leads to erroneous evaluations of material by non-specialists. All suspect material should be examined by an osteologic expert, and all material which is not identifiable with ease should be considered as suspect.

Once the human remains have been isolated, a thorough description of each piece is undertaken. The preferred description includes a critical analysis in addition to a morphological description or simple notation of presence or absence. The production of an extensive record affords more than an ability to make statements regarding the remains from a single site. The records from a series of archaeological sites enable scholars to compare groups over large geographical areas and to evaluate human behavior on a cross-cultural basis. The biological and cultural data may be evaluated and compared, with the results aiding in drawing a larger picture of human history. The purpose of each site study should, in theory, be seen as helping to develop a definitive data base for the osteological study of increasing larger areas of focus. For example, the study of the limited material from the Pezoules Kefala enclosures at Kato Zakro (Becker 1975a) affords scholars a glimpse at the lives of the people in the area of Kato Zakro at some time in the distant past, as well as providing the means by which the sites throughout eastern Crete may be compared. Similarly, the Aegean area as a whole may be considered, and so on in increasingly larger zones of interest. The use of material from one locus to study geographically expanding situations parallels studies which isolate a single period of time, as represented by the human remains of that era, and seeks to understand biological and cultural changes in human activities as they occurred before and after that chronological focal point.

The initial presentation of data generally falls into two categories. The best known sector encompasses metric data of all types. Although for some years general descriptive (non-metric) information had been considered of little value, and therefore was only minimally included in the record, recent developments have shown this sector to be vital to the data base (Berry and Berry 1967). Descriptions of various non-genetic traits, pathologies, and other observations may prove extremely helpful in later analyses.

The analyses of these data enable studies to be made of individual and multiple populations resulting in a clear understanding of a large number of aspects of human behavior as follows:

1. Population structure: absolute size (total numbers of people) and composition of a given village, town, etc. This includes information on the age of members, sex ratios, differential mortality rates, and other

concerns of demographers. Angel (1975:385, 387) clearly demonstrates the importance of evaluating fragmentary remains to identify infants and children in a population (see also Becker 1975a, In press).

2. Paleopathology: diseases that existed among these people can often be determined from careful scrutiny of their remains. Prostheses and other cultural responses to problems of health and disease can be evaluated better when supported by evidence from osteological findings.

3. Cultural behavior:

A. Migration patterns: all data concerning genetic relationships, population contacts, and (least likely of all) actual movement of large numbers of people may be considered within the context of "migration". The flow of genetic material, its value and pattern, may be reconstructed through osteological analyses of numbers of sites over large areas (see MacCluer et al. 1971).

B. Diet and localized aspects of culture, such as treatment of disease, differential mortuary patterns, and other aspects of daily life may be elicited from the archaeological record through studies of human skeletal material, and the contexts in which they are found (e.g., ritual use of human remains, such as holy relics in the Catholic church and other religions, may be indicated by the repeated discovery of specific remains in ritual contexts: the existence of "tooth fairy" or parallel folk beliefs may be indicated by the distribution of deciduous or milk teeth throughout a site).

<u>The Development of Modern Theories in Human Osteology</u>

The development of modern physical anthropology may be traced to a number of areas of study including taxonomy and phrenology. Interest in measuring living things as a means of describing them reflected the beginnings of scientific orderliness. Observations concerning the different populations of <u>Homo sapiens</u>, often termed races, resulted in the development of simplistic categorizations most commonly based on skin color. Skull shapes were also found to vary widely between populations. The ease with which a head or skull could be measured, and the propriety involved in the study of a "person" simply by the removal of a hat afforded the delicate Victorian scholar with a simple and chaste means of data gathering. The archaeological situations of the nineteenth century suffered from technological limitations which paralleled the social limitations of the students engaged in studying the "biology" of living populations. Archaeological remains were often damaged and few field workers knew enough to recognize post-cranial human remains. Field archaeologists tended to save only a limited sample of skeletal material, consisting for the most part of intact skulls.

Unfortunately, the limited data secured from living and dead subjects tended to be derived from studies of the skull alone. The data secured, however, was often generalized to extreme conclusions. Many scholars believed that all skulls could be fit neatly into categories such as Nordic or Mediterranean on the basis of approximate skull shape.

In the forefront of nineteenth century studies in physical anthropology were the German scholars, supported by their European colleagues. Their diligence in recording the metric and other aspects of the human body created the idea throughout the continent that "anthropology" meant what American anthropologists see as only the subfield of "physical anthropology". The tools employed in their studies derived from the phrenologists' kits, to which were added such items as graded hanks of hair to standardize the assessment of hair color in the living, and glass eye sets to match with those of the people being studied. But of greatest importance to us here are the instruments used for measuring the heads and stature of the living and the skulls and bones of the dead.

Although the German tradition of physical anthropology was ultimately to produce Rudolf Martin (1914), a far more common product was an intellectually myopic scholar passing a lifetime manipulating limited data. These data were excruciatingly detailed descriptions which were of no value. Often these researchers became fixed upon the study of the head (or skull), generating vast numbers of tables and formuli and issuing pronouncements which were never tested by means considered fundamental to modern scholarship.

This focus on the skull can be traced through the German school of physical anthropology and their meetings held to discuss and exchange information about the braincase. A Craniometric Conference held in Munich in September, 1877, was hailed as a grand success, leading to a second held in Berlin in August of 1880. These meetings may be characterized as a series of didactic presentations which were variations on the same theme, but without positive movement. No improvements were made in methodologies, nor were there attempts made to standardize procedures (see Anonymous 1884). Even more significant, once some agreement was achieved on how studies should be conducted, was that no one ever asked why or for what purpose these studies should be made.

These developments paralleled the inception of extensive excavations throughout the Classical world. Since both the craniometricians and the anthropometricians were equally unable to do more than collect data, the former - with their ready answers to problems of racial and ethnic history - became more widely sought by archaeologists. Archaeological excavations were more likely to find the less dense post-cranial skeleton in a damaged state, leaving only the skull, or fragments thereof, to be recovered. By 1900 the idea that skull "shape", calculated as a percentage by dividing the width by the length, could serve as an accurate predictor of "race" had become generally accepted. Despite serious misgivings based on the evidence, most scholars were willing to assume that these two measurements served as an accurate means by which "race" could be determined in *Homo sapiens*.

Not only were archaeologists led to specious reconstructions of culture history on the basis of data derived from theories regarding skull shape, but linguists became involved in these erroneous arguments. A fundamental principle of modern cultural anthropology is that culture, race, and language are completely independent systems. This postulate was unknown in the early part of the century, as in the example of the decipherment of the Hittite language. Bedrich Hrozný correctly "deciphered" Hittite from texts from the archives at Boghazkeui, and concluded that Hittite was an Indo-European language. He later assigned Hittite to the Kentum group. These conclusions first were announced at the November 1915 meeting of the Near Eastern Society in Berlin. Repeated presentations of this lecture, and its ultimate publication ("Die Lösung des hethitischen Problems") were met with ridicule because the theory conflicted with existing and entrenched concepts of the position of the ancient Hittite language, which were based on biological assumptions (see Metous 1949).

The argument against Hittite being an Indo-European language derived from the assumption that the Hittite people belonged to a "non-Indo-European" race, since they had large, curved noses and sloping foreheads similar to the "Armenoid" physical type. This led the famous German Assyriologist, Dr. Weidner, to contend that Hittite must have been a Caucasian language, probably related to Gruzinian. Weidner's conclusions regarding the linguistic affiliations of Hittite did not derive from a study of the language but rather were inferred on the basis of a specious relationship between "race" and language. The correct decipherment and assignment of Hittite made by Hrozný was resisted on the basis of an argument containing severe errors of logic. Fortunately, such errors regarding language and population rarely occur today, and various complex analyses regarding the development of writing and inferred population movements have been successfully evolved (see Brice 1972:16).

Given the ease with which linguists once confused the relationship between physical type and language, one can easily understand how archaeologists came to make similar errors regarding the relationship between "race" and culture. Excavators, generally believing that only the skull would be of use to anthropologists, retrieved little, if any, post-cranial material. W. L. H. Duckworth (1904:9) commenting on the recent additions made to the Cambridge collections, called the "crania from Crete,..." among the "note-worthy specimens..." Duckworth neither mentioned the site(s) from which they came nor the excavator. One should note that he spoke only of crania and considered as important only that they were from Crete. Similarly, Xanthoudides' (1924) sparse commentary on the skeletal material from the vaulted tombs of the Mesara deals only with the skulls, which were represented by but a few fragments. Such limited concern for skeletal material characterized research in the Aegean until the 1940's.

At the turn of the century Franz Boaz (1899) contributed a significant article concerning this problem to the first volume of the new series of the American Anthropologist. Boaz demonstrated that the cranial index was not a "racially fixed" entity and was subject to great variation within a population. Subsequent work by Boaz (1910, 1912) and various other studies over the next fifty years not only convinced most American anthropologists of the failings of early craniometric pronouncements, but led the way to modern studies of human biology.

One may summarize the century of the traditional studies by noting that the accurate quantification of countless measurements together with extensive attempts at characterizing the complexities of biological form achieved almost no useful goals. No tests were made of the validity of these projects, nor were goals established. Traditional description and measurement yielded little data which could provide meaningful comparisons between populations (Lestrel 1976). The coarseness of the indices used and the lack of comparability between researchers' methods, and often between various methods used by a single scholar, resulted in the production of volumes of useless data. The questions asked all involved the "simple" evaluation of race, which was "determined" by the cranic index. No statistical considerations were given to the validity of the statements being made by generations of scholars using this information.

Not until the period immediately before and during the Second World War was there any significant anthropological analysis of human skeletal material from the Classical world (see Angel 1942 through 1945). As with the analysis of skeletal populations from archaeological sites elsewhere in the world a slow change began to take place in the means by which this material was recovered and evaluated (see Washburn 1953).

The focus on cranial data (see Meiklejohn 1976) created two problems which continue to interfere with modern research. First, a tendency toward increasingly simple methods of "racial" evaluation led to the cranic index (cephalic index in the living) being regarded as a useful, if not the only means by which an individual could be identified as to "race", or area of origin. Second, the focus on the skull led many archaeologists to ignore postcranial remains even when found in good condition.

Requirements of Modern Studies

Of the four major requirements necessary for modern studies of human skeletal remains, of primary importance is the recovery of intact material. Excavation procedure may reflect the conditions which prevail at a site, and the state of preservation of the remains. A trained physical anthropologist is most needed where remains are fragmentary or bound in calcareous or other matrices. Well preserved remains may be recorded and removed for storage by any skilled archaeologist. However, a general rule in excavation would be to delay removal of skeletal remains, if at all possible, until a specialist can complete the task. All bones should be cleaned, photographed, and recorded by drawings and text *in situ*. Skeletal material should always be stored on trays, never stacked or piled or bagged.

All of the skeletal material and suspect pieces from an excavation should be examined by a physical anthropologist to determine if fragments of human bone or intact small bones are present. If at all possible, no adhesives or fixatives should be used in recovering remains. Plaster or wax casts or supports should not be used to remove skeletons or to hold bones together. In damp situations drying the remains by clearing and exposure to air, or by using artificial means, may be useful in allowing excess water to evaporate. Water weakens skeletal structure, and drying makes the material much less likely to be damaged. The basic need is to recover intact as much material as possible and to record the field data regarding exact position of bones in the best way possible. A "hierarchy of recovery", adjusted to the amount of available time, number of persons involved in the work, and the potential value of each bone in producing useful information, may determine how the specialist removes material. A great deal of attention may go to the recovery of certain epiphyses while others are ignored. All of these problems are best left to the experienced physical anthropologist.

Description and analysis by procedures suitable to modern analytical techniques constitute the second requirement of modern studies of skeletal remains. Briefly, this requires a complete listing of every bone found, with an evaluation of its condition. An analysis (metric and pathological) can be achieved by a specialist interested in programming the data. Simple information on age, sex, stature, general health, and other facts pertinent to the skeletal population can produce useful material for the archaeologist. More complex problems of gene flow, migration, etc., must await the analysis and statistical evaluation of series of data, usually in comparison with populations from proximal sites, or at least from sites with some geographical relationship.

Careful attention should be given to cremation burials and even scattered, charred, and fragmentary remains. Not only has the potential for evaluating these bits of bone increased enormously, but the condition of charred bones often enables the observer to estimate fire temperature and to reconstruct the way in which the cremation was conducted. A surprising wealth of data may be gleaned from a handful of charred remains.

Perhaps the most significant achievements in the area of description and analysis of the cranium have been the studies done on epigenetic variation. The work of Berry and Berry (1967) and others employing these techniques have been shown to relate correctly populations whose historic relationships are well documented. In these cases the evaluations of skeletal remains have been shown to be capable of accurately assessing relationships entirely independent of other data.

A final note regarding studies of the human skull concerns observations on dental mutilation. Human dentition reflects diet and behaviors in many indirect ways. Direct insight into some behaviors may be derived from studies of the decorations and/or mutilations which are found on human teeth (see Van Rippen 1918). Although such customs rarely appear among the ancient populations around the Mediterranean, close attention should be directed to the possibilities, and negative evidence should be noted.

Evaluations of post-cranial pathologies often rely on inferences regarding possible cultural behaviors. Two examples of sacroiliac fusion of the right joint appear among the human skeletal population (Terry Collection) at the Smithsonian Institution (No. 1597 Negro male 36; No. 321081 U.S. 212/1915 male: Becker's age estimate 60 plus). A tentative hypothesis regarding these two cases might associate the problem with right-handedness, and a disposition toward a particular right leg action which caused inflammation and ultimate fusion in that joint. Although this collection does not represent a cultural population, similar cases of fusion are known from Eastern Crete (Becker, field notes). Should the incidence of a particular problem be found consistently in one joint or set of joints, or other localized position one might suspect an association with a cultural activity. Occupational disorders and other behaviors with recurrent physical activity might be diagnosed through a study of the skeletal material.

Only brief note need be given to the third requirement of modern studies of human skeletal material - the computer evaluation of metric and non-metric traits. This analytical technique is entirely dependent on the successful completion of the two aspects listed above. The results of computer analysis are only as good as the data processed, which means that good recovery of material and skilled analysis is essential. A number of programs have been worked out to date, such as that used by W. W. Howells (1973). No more need be said about this level of analysis as the first two are most important concerns of field archaeologists.

Conventional metric analysis had been found wanting in most evaluations, generally due to an inability to make meaningful comparison between very large sets of data. New computer programs, using both metric and non-metric data, provide not only a basis for comparison between populations, but also offer models which can be used by other researchers. Such procedures have been augmented through still other innovative analytical possibilities. Lestrel (1976) suggested the use of Fourier analysis as an improved means of processing data, and Hursh (1976) added an alternate technique for the multivariate analysis of cranial variation most commonly used to deal with problems of allometry.

The fourth area in which modern studies operate concerns experimental research. Although the problems of using human subjects sharply limits experimentation, various medical situations may be studied as test cases. In addition to this growing relationship with the medical profession, physical anthropologists also join forces with anatomists and psychologists.

An outstanding example of comparative studies which apply to physical anthropology may be found in the work of Pucciarelli (1974) on experimental deformation. The incidence of a particular and relatively uncommon horizontal suture at the back of the skull, which divides the occipital bone into two sections, was extremely high among ancient Peruvians. The incidence among that population was so high that the "extra" bone created by this peculiar suture is often termed the Inca bone (os inca). The population manifesting this peculiarity often artificially deformed their skulls to create a more "beautiful" shape. Pucciarelli conducted experiments which artificially deformed the skulls of rats. He then found that there were high frequencies of wormian bones in the deformed rat crania, more than in the control population and in a sham-operated (operated but not deformed) group. Puciarelli suggested that these experimental deformations may be an extra-genetic factor which effects the normal expression (occurrance) of wormian bones, which he believes "represent an epigenetic polymorphism".

This kind of experimentation offers new research directions to all studies of human biology whether they relate to discontinuous cranial traits or to similar genetic factors (see also Land and Sublett 1972). During the next decade one may expect even more sophisticated experimental techniques to be developed, all of which will be important in determining means by which skeletal material can be made to yield more information regarding ancient socities known only through the evidence recovered by archaeology.

Potential Results of Modern Studies

As one can easily understand from these brief considerations of the various requirements of modern studies of human skeletal material, the potential results of this work are overwhelming. For instance, the kinds of analysis being conducted by J. L. Angel in Turkey and Greece (see Angel 1973a; Mellink 1973) may reveal patterns of descent, information on social classes, and other clues to aspects of these people for which no artifacts may be found. The ability to reconstruct biological lineages from burial patterns and the associated remains enables modern scholars to understand the workings of past cultures and to study microevolution (Cadien et al. 1976). Such studies applied to Crete might also clarify problems of migration and culture contacts as they have been used to confirm cultural interactions among American Indians living on the Plains. The ability to study lineages as distinct from the general population at a site, however, depends to a large degree on the care with which human skeletal material is recovered and the attention afforded careful excavation and recording of context.

An outstanding example of the use of human skeletons to provide data which may be used to infer residence patterns has been provided by R. A. Lane and A. J. Sublett (1972). These scholars utilized well-preserved skeletal material to provide non-metric traits which enabled them to make genetic distinctions among American Indian populations. This information, when properly evaluated, revealed basic data on social organization (rules of residence). The evaluation of the bones had to be combined with the archaeological data in order to produce such rewards, as is the case with all similar analyses which seek to provide cultural data on this level. In short, these approaches show the best interaction between the archaeological and physical anthropological record in a way which maximized interpretive possibilities.

Even more finite data serves as a target for contemporary studies based on details of human genetics. In 1900 Mendel's fundamental laws of genetic inheritance were independently rediscovered by three researchers. During and after the Great War these data were applied with increasing frequency to studies of human populations. By the 1920's the rudiments of human blood group inheritance had been worked out. Some fundamental application of genetic data pertaining to other aspects of human biology were considered (Boaz 1928). Growth beyond this point was excruciatingly slow until nearly 1960.

Howell's (1957) work on the factors which determine the size and shape of the human body concisely dealt with many of the factors which were considered to be major problems for 75 years (Boas 1899; Boaz 1910, 1912). Genetic and other data had become available for these studies since scholars had first begun to examine the ideas of the nineteenth century German school of physical anthropology. The many means available to evaluate human skeletal material provides the potential for contemporary physical anthropologists to test theories presented by various authors regarding ancient migrations and culture contact (see Crossland and Birchall 1974) in ways undreamed of 50 years ago.

The specifics of modern research depend on studies of genetics as applied to human populations, which have blossomed during the past two decades. The application of the results also has been encouraging. For example, a project to determine the inheritance pattern of shovel shaped maxillary central incisors (Portin and Alvesalo 1974), carried out in Finland, has demonstrated that this well-known trait is not only hereditary, but that it is probably transmitted by a single intermediate autosomal gene, if not transmitted by a more complex genetic linkage. Such specific bits of information enable researchers to examine skeletal populations with an eye to working out familial relationships with a high degree of probability using an assortment of such traits for which the inheritance pattern is now understood.

In a manner similar to the influence of genetics on studies of human biology, the great medical advances of the Twentieth Century have provided vast quantities of relevant data. Of particular note are those studies dealing with osteoporosis, or loss of bony tissue due to various causes, including space travel. Osteoporosis once was assumed to be related only to the aging process. When rarification of bone tissue developed in extremely healthy astronauts a great research effort was launched to discover causes (Urist et al. 1963). Since osteoporosis is one of the most easily observed and commonly found "pathology" in archaeologically recovered populations, all information regarding possible etiologies is of great interest to physical anthropologists.

Among the possible etiologies for osteoporosis are osteomalacia, osteitis fibrosa, multiple myeloma (see Urist et al. 1963) and inflamed joints or bone surface due to trauma of all kinds. Fractures not only involve trauma, but the subsequent immobilization and disuse, similar to that involved in space travel (see Harris and Heaney 1969), also produces osteoporosis. Cushing's Syndrome is regularly accompanied by osteoporosis. Such bone loss, or a condition of too little bone (osteopenia), leads to high fracture susceptibility. Osteoporotic bone can only be seen as defective, usually with a dead tissue in the process of resorption as part of a degenerative process (Nichols 1968:220-21). In fact, the most familiar cases continue to be associated with senile deterioration and postmenopausal degeneration. Senile osteoporosis of the spine, which results in "shrinking", or a reduction in stature, is commonly seen. As much as three inches in torso length could be lost in two years (Nichols 1968:222). Since no changes occur in the length of long bones, by which stature is calculated, one would need to know how this problem alters calculations of height, as well as how it influenced the health of the individuals experiencing the problem.

In general, osteoporosis, as well as dozens of other disorders, can be recognized by the changes they cause in the bone. These alterations can be "read" along with other observations made of skeletal remains, thereby providing another dimension to the information recovered by the archaeologist.

In summary, one can demonstrate a great need for modern techniques of recovery and analysis of human physical remains. Consideration of the theories of the past, regarding the relationship between cranial form of individuals and what the form indicated are necessary to understanding why so many errors were made in both archaeological and linguistic matters. New considerations of old problems have brought these studies into the twentieth century, and provided us with vastly improved means by which we can reconstruct the past.

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A MONUMENT TO ROLEY: A CAUTIONARY TALE IN HISTORICAL ARCHAEOLOGY

Marshall Joseph Becker

The last members of the long line of Vickers family potters ceased production in Chester County, Pennsylvania in the 1870's. This ended over 100 years of manufacturing utilitarian and fancy ware pottery. In the Fall of 1971 bulldozing operations designed to level a parking lot east of the Vickers pottery site near Lionville uncovered the remains of wasters (rejects) and saggers from the family's last pottery-workshop. This pottery was of great interest because it was the last in a series of workshops that had been built by members of the family. The first work at this site dates to approximately 1820. During that period Thomas and Isaac M. Vickers were in business together in a partnership that ended in March of 1821. John Vickers was making earthenware and water pipes at this site in Uwchlan township, and many people believe that he was experimenting with porcelain making. In order to seek direct archaeological evidence regarding experiments in porcelain manufacture, a ceramic sample was gathered at the site. Although this research proved inconclusive, another problem was brought to our attention.

During the first reconnaissance at the site, a small tombstone and two other pieces of tombstones were located in close proximity to a cistern which presumably stood near the pottery shed. The intact tombstone, which measures about 14 cm. thick, 30.6 cm. wide and 36.3 cm. tall at the front, has a beveled curved top. On the beveled surface, in bas-relief, was the name "Roley". On the face of the stone were the dates 1882-1896, and the inscription "A faithful Friend". One of the two tombstone fragments, each about 8 by 45 by 50 cm., had the letters H.H., and the other appeared to have no inscription.

Of two possible hypotheses as to the origin of these pieces the less likely was that they had been removed from a nearby Quaker (Friends) cemetery for some reason. More likely was that the dated marker, denoting a lifespan of some 14 years, had been placed over a family pet which had been buried on the property. The other two fragments were assumed to be variants on the dated marker. Pure serendipity led me to meet the woman who not only knew the entire tale but had extensive documentary evidence of the dog named Roley. Mrs. Eric Hall Morrison knew all about Roley because she was married to the grandson of Albert C. Hall, Roley's owner. Colonel Albert C. Hall was an officer in the United States Army. His many assignments in foreign lands greatly disrupted the schooling of his children and the stability of the family. To provide a secure home for his family Colonel Hall established a permanent residence at The Hill along the Boston Post Road (present Fairfield Avenue) in Stamford, Connecticut. While living in Stamford in the early 1800's the Hall family came into the possession of Roley.

Audrey Hall, the daughter of Albert C. Hall, grew up with Roley. A portrait of Audrey as a young girl, holding a small white dog, which is probably Roley, remains in the possession of the family. The family also has a small, circular oil painting of Roley. This depicts a small white dog with brownish tints, possibly a Maltese terrier. This breed is quite small, with short wiry hair. A miniature heart-shaped lock of gold engraved 1892, now worn on a bracelet by Mrs. Eric Morrison, is said to have been Roley's collar lock.

Roley died in Stamford in 1896 and was buried on the grounds of the Hall family house. Numerous other pets were also buried on these grounds, over the years, with monuments erected for each. Quite probably the marker with the engraving "H.H." is one of these. Around the turn of the century Audrey Hall met and married Lt. William E. Morrison, who became professor of modern languages at the United States Military Academy in West Point, New York. Audrey Hall Morrison thus came to reside in the West Point area with her husband.

For a considerable period of time, Eric Hall Morrison, the son of Audrey Hall and William E. Morrison, and his wife Christine lived in Lionville, Pennsylvania in the house which had been the residence of the Vickers family. Mrs. Christine Morrison believes that Roley's tombstone arrived in Lionville about 1950 in a shipment of furniture which had been at her husband's parents' home at West Point. After the death of Mrs. William E. Morrison the furniture and other items had been stored. Among the furniture was a sundial which had been in the garden of the West Point lawn, and which in turn had come from Stamford. Although Mrs. Morrison recalled that many of the items delivered to Lionville had been at West Point she could not remember ever having seen the tombstone of Roley at West Point. When the tombstones reached their "final resting place" in Lionville, the monuments were used as stepping stones in the garden. When the Morrisons left Lionville about 1956 they left them on the property. They were disturbed by the bulldozer in 1971, when work was begun to turn the old house into a modern version of an old country tavern. The builders, however, saved Roley's marker and embedded it in the floor of the entry to the tavern as a decorative element.

This story should caution archaeologists, whose goals of reconstructing man's past are often strongly influenced by their own concepts of history. The story of Roley and his monument could never have been inferred from the simple act of locating his tombstone in Lionville, Chester County, Pennsylvania. The suppositions, inferences, problems, and other considerations which could have been generated by the discovery of this artifact in no way could have been resolved through the analytical techniques now known to archaeology, or by expensive or extensive excavations on the site of discovery.

The Henry C. Mercer Brandon Gunflint Collection

David G. Orr & Paul R. Morris, Jr.

While writing on the manufacture of gunflints in 1814, Johann Beckmann (1846:537) stated that:

> Many of my readers will perhaps be desirous to know in what manner our gunflints are prepared. Considering the great use made of them, it will hardly be believed how much trouble I have had to obtain information on the subject.

While the interest in the gunflint today is generally less practical and more scholarly, this statement still constitutes a valid caveat for any flint researcher.

Flint knapping is an ancient traditional craft industry, indeed, one of man's earliest technologies. In England, the more specific utilization of flint in firearm ignition systems probably dates to the end of the eighteenth century; although some continental production clearly antedates the English gunflint manufactories (Witthoft 1966:36). Specifically, the English gunflint industry is related closely to the earlier French producers. The Brandon gunflint industry, the producer of the collection we will be examining in this study, may have been founded by French prisoners-of-war quartered in England during the Anglo-French wars of the late eighteenth century (Clark 1935:49; Witthoft 1966:36). At any rate, the loss of the French gunflint trade due to the unsettled political climate created an exigency which doubtless led to the establishment of the English gunflint industry.

The town of Brandon, located on the border of Norfolk and Suffolk, was the primary producer of gunflints in an area which contained several other makers (See especially Wyatt in Stevens 1870: Lovett 1913; Clark 1935; Knowles and Barnes 1937; and Witthoft 1966). The flint found near Brandon is of a superior quality because of its structural homogeneity, fossil-free nature, and the marked ease by which the stone is chipped. The Brandon flint is found by sinking stepped, angular shafts to an average depth of forty to fifty feet. The material is extracted solely by hand. No windlass, rope, or ladder is employed in the mining operation! Only shovels, hammers, crowbars, and one-sided picks are utilized. The mining operation forms a distinct occupational group, which does not take part in the actual working of the stone itself. Unlike the English country potter, who digs his own clay, and the basketmaker, who cuts his own oak saplings; the flint knapper does not obtain his own raw material.

The actual knapping of the flint at Brandon occurred in domestically related workshops owned and operated by the flint knapping masters and their apprentices. During the first three decades of the nineteenth century, gunflint knapping made heavy demands on Brandon's labor force. As a result of the Napoleonic conflicts, perhaps as many as two-hundred men were employed in the Brandon gunflint industry (Clark 1935:51). The mid-nineteenth century decline in gunflint production can be directly attributed to the two revolutionary inventions of the friction match and firearm percussion cap. The industry survived these two important developments by responding to new markets where the traditional flint firearm ignition system and the strike-a-light or tinder-box flint resisted the new technological advancements. In 1870, tinder-box flints were being manufactured in Brandon for export to Brazil and the Orient (Evans 1872:16). Interestingly enough, during the same time, there were three master flint knappers and thirty workmen operating in Brandon (Wyatt in Stevens 1870:579). Lovett (1913: 7-8) writing in the 1880's suggested that tinder-box flints went to Spain, Italy, and "even further off than that"; and that gunflints were shipped to Zanzibar for the East and Central African trade. The Brandon gunflint industry in the nineteenth century thus seemed to "follow the flag", and Brandon's flints ended up in Turkey, the British Orient, and even North America. After World War I, gunflint making actually ceased for a time in Brandon, due to the lack of an effective market (Woodward 1951: 58). Yet today, a portion of the English gunflint industry still survives as a producer for gun collectors, "Bicentennial" reenactment groups and the like, and others who still treasure the flintlock firearm.

The best description of how Brandon flint knappers went about their craft is contained in two articles by Clark (1935) and Knowles and Barnes (1937). The process is divided into three major sequences. These are the quartering of the flint nodule, the removal of longitudinal strips - blades from the nodule, and the division of the blades into separate flints. These steps are illustrated by figures 6, 7 and 8 (See also illustrations in Lovett 1913:coverpiece, Clark 1935:plates VI-VIII; Knowles and Barnes 1937:202-figure 1 and 204-figure 3; and Singer et al. 1956:135-figure 57). During the first stage of the process, the knapper (wearing an apron) places on his left knee, (which is protected by a leather pad) a large nodule of flint and strikes it with a quartering hammer (a three-and-a-half or five pound sledge); thereby breaking off a smaller easily workable piece or core. Each piece broken off of the nodule must exhibit or possess a flat striking platform for the removal of the blades. The most difficult stage according to Clark (1935:49) is when the blades are removed from the cores. This stage necessitates the use of a hammer; originally at Brandon oval-headed, but later replaced by the pointed-headed, French flaking hammer. The core is held on the leather knee pad with the striking platform facing upward and at a firty-five degree angle. With a series of light hammer blows, first the cortex is removed and discarded, and then the blades are struck off. The last major stage of the manufacturing process is concerned with the actual knapping or separation of the long blades into the individual flints. The innovativeness of the Brandon flint knapper is revealed in this stage, since they perfected a "micro-burrin" technique, whereby the blades are separated into segments by the action generated by a stage or chisel, wrapped in leather and set in a wooden anvil, and then struck with a light chisel-edged hammer (See especially Knowles and Barnes 1937: 201-207; and also Witthoft 1966:39). Each individual gunflint is then finished by blunting the back with fine secondary chipping and by slightly undercutting the edge in a similar manner; and each strike-a-light or tinder-box flint is finished by blunting all four edges. The tools used and the flint in all stages of the process are illustrated in figures 6, 7 and 8 (see also illustrations in Clark 1835: plates I-VIII).

The Henry C. Mercer Brandon Gunflint Collection currently found in the University Museum, University of Pennsylvania, Philadelphia, Pennsylvania, reflects the process described earlier and the amazing tenacity displayed by the entire English gunflint industry in the late nineteenth and early twentieth centuries. Henry C. Mercer in 1893 collected a rich sample of both the tools and the products, in all the steps of manufacture, from Fred Snare's workshop in Brandon, England (Mercer n.d.) Lovett (1913:8) describes Fred Snare as "not only a most expert flint worker, but he has a wide knowledge of his subject and is always ready to assist those who are interested in the manufacture of gun-flints". His annual output in Lovett's time (ca. 1913) was only about a million flints. His father, R. J. Snare, reportedly manufactured in 1880 about 4,500,000 flints (Lovett 1913:8). Mercer obviously benefited from the warm hospitality of Mr. Fred Snare of Brandon. The Henry C. Mercer Brandon Gunflint collection also represents an early acquisition by the fledgling University of Pennsylvania Museum. The collection seemed, in recent years, to first attract the attention of Professor John Witthoft, who mentioned it in his article cited above. Our article represents the first major publication on the entire collection.

THE HENRY C. MERCER BRANDON GUNFLINT COLLECTION

All measurements are given in centimeters. The condition of the artifacts is good unless otherwise noted.

CLOTHING AND PROTECTIVE APPAREL

A. Cotton apron with ties
Unnumbered
Length: 97
Width: 77

B. Stiff leather leg guard with pads and clasps
#12117
Length: 29
Width: 15

C. Soft leather fragment - poor condition
#12118
Length: 50
Width: 28

D. Whitewashed board of undetermined nature, possibly used in conjunction with B and C
#12111
Length: 29
Width: 9
Thickness: 2

TOOLS

E. Steel file, stamped on one side "CAST STEEL WARRANTED" and a reversed "E", and stamped on the other side "PAT. FOR SHEFFIE(LD)"; and with a round, hand chamfered, wooden handle
#12119

Steel file -	Length:	25	Wooden handle - Length:	11
	Width:	2.5	Width:	2
	Thickness:	.5		

F. Bipointed, octagonal-faceted sledge, with a round, hand-chamfered wooden handle - well used condition
#12116

Iron head -	Length:	15	Wooden handle - Length:	21
	Width:	5	Width	2.5

G. Bipointed, flaking hammer, with a round, hand-chamfered wooden handle - well used condition
#12120

Iron head -	Length:	10	Wooden handle - Length:	20
	Width:	4	Width:	2

H. Specialized knapping hammer, with a steel head constructed from a reworked file, and with a reworked, turned, wooden handle - unused condition
#12115

Steel head -	Length:	17	Wooden handle - Length:	29
	Width:	.5	Width:	2
	Thickness:	ranges from 1 to .2		

I. Iron stake - well-used condition
#12087
Length: 14
Width: 3
Thickness: 4

J. Wooden and leather stake rest, used in conjunction with I - well used condition
#12087
Length: 14.5
Width: 9
Thickness: 2.5

FLINT:

(See charts which follow detailing the dimensions of the various types and grades of gunflints.)

The gunflints contained in the Henry C. Mercer Brandon Gunflint Collection are indicative of seven major types, three of which are further subdivided into five grades. The charts provided clearly illustrate the range of each type and grade. Additionally, some note should be made clarifying the meaning of each Brandon flint type. The smallest flints are denoted as "pocket pistol" gunflints. Originally used for small flintlock firearms which could be secreted away in the owners clothing; the Brandon pocket pistol examples indicate the continuing market for these types of guns. The size of the flints, therefore, generally reflects the size of the flintlock mechanism. Thus, a horse-pistol, with a larger flintlock mechanism, would use a larger flint, than a pocket pistol. Long-gun flints, ranging in size from smallest to largest, are called rifle, single-gun, carbine, and musket. Tinder-box flints or strike-a-lights are slightly larger than musket flints, and are generally more crudely fashioned than the gunflints and are much heavier. Witthoft (1966:37) correctly observed that one Brandon tinderbox flint was fashioned from a core rejuvenation flake. The last category is a most mysterious and ambiguous one, even for the most diligent gunflint devotee. These, the so-called spindle flints, are noted only in Witthoft's brief mention of the collection in his article (1966). The tag which accompanied the collection indicates the name, but no one seems to be able to shed any light on this class. They appear nowhere else in the literature. The spindle flints are square exhibiting fine, secondary chipping on all four sides, and are uniform in quality. They are a puzzlement to the authors as well.

Three of the above mentioned types of gunflints - horse-pistol, carbine, and musket - are further subdivided into five descriptive grades. These are double-edge, second, common, chalk-heel, and gray. The double-edge grade is self-explanatory: each side of the flint can be used to strike the battery of a flintlock mechanism. Double-edge flints are at the top of the Brandon quality pyramid in every respect. Seconds are basically the same as double-edge flints, except only one edge is acceptable for use. Commons refer to flints which are inferior qualitatively to the above two types. Flints with a chalk cortex are called chalk-heels and flints made from gray flint are called grays; both are inferior in quality to the above three classes.

The collection also includes a rich assemblage of flint in every stage of the manufacturing process. The sample includes large unworked nodules, cores, blades, and the flint debris resulting from the manufacture. A full description and analysis of these flints will be undertaken by the authors in the near future.

In summary, the Henry C. Mercer Brandon Gunflint Collection, is an outstanding assemblage of the late nineteenth century English gunflints, and typifies an English industry which had changed little in the preceding century. Therefore, it can throw light on the trade gunflints found in historical archaeological sites in North America and elsewhere. The impressive range and size of the collection is also crucial in any appraisal of the English gunflint enterprise and all its cultural ramifications. It forms a rich material cultural resource upon which both artifacts and verbal data can be incorporated. The mensuration included in this study dramatically demonstrates that not only was there dimensional diversity among the various types of gunflints, and indeed, within each class, but also testifies to the "workmanship of risk" (Pye 1968) inherent in a very difficult stone working technology. The technology utilized in the Brandon gunflint industry, as described above, also illustrates an excellent example of cultural polygenesis; since the most significant aspects of the industry were also known to Mesolithic man in Europe (Witthoft 1966:41). Finally, it is hoped that this study will serve as a comparandum for the necessary research which must follow our labors.

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D.G.O., P.R.M.

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

POCKET-PISTOL

Number	Back-Edge	Side-Side	Thickness
12090-1	1.45	1.4	.45
2	1.75	1.35	.5
3	1.6	1.2	.4
4	1.45	1.1	.45
5	1.4	1.4	.4
6	1.5	1.25	.5
7	1.4	1.1	.5
8	1.55	1.2	.6
9	1.7	1.3	.4
10	1.6	1.1	.55
11	1.7	.7	.4
12	1.8	1.4	.6
13	1.45	1.15	.55
14	1.5	1.25	.5
15	1.55	1.2	.3
16	1.5	1.3	.6
17	1.75	1.5	.35
18	1.5	1.2	.4
19	1.3	1.0	.4
20	1.2	1.15	.4
21	1.6	1.25	.5
22	1.6	1.2	.45
23	1.6	1.1	.6
24	1.5	1.2	.5
25	1.5	1.2	.55
26	1.8	1.5	.5
27	1.4	1.1	.45
28	1.4	1.1	.3
29	1.4	1.2	.5
30	1.6	1.3	.2
31	1.5	1.1	.4
32	1.4	1.2	.5
33	1.5	1.1	.3
34	1.6	1.2	.5
35	1.4	1.15	.3
36	1.6	1.3	.5
37	1.5	1.2	.45
38	1.3	1.1	.35
39	1.6	1.3	.5
40	1.3	1.0	.3

RIFLE

12089-1	2.3	1.9	.6
2	2.0	2.0	.7
3	2.1	1.95	.6
4	2.1	2.0	.8
5	2.05	1.95	.5

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

RIFLE - Continued

Number	Back-Edge	Side-Side	Thickness
12089-6	2.1	1.8	.6
7	2.1	1.9	.6
8	2.0	2.0	.6
9	1.9	1.8	.7
10	1.75	1.9	.75
11	1.9	1.6	.5
12	2.2	1.9	.55
13	2.0	1.9	.45
14	2.0	1.95	.6
15	2.25	1.85	.5
16	1.95	1.85	.55
17	2.3	2.05	.5
18	2.1	1.95	.35
19	2.1	1.95	.5
20	1.8	1.7	.6
21	2.35	2.0	.65
22	2.3	2.1	.8
23	2.15	1.85	.5
12104-26	2.1	1.8	.6

SINGLE-GUN

Number	Back-Edge	Side-Side	Thickness
12092-1	2.6	1.9	.6
2	2.4	2.1	.7
3	2.5	2.3	.5
4	2.45	2.15	.55
5	2.5	2.3	.5
6	2.45	2.0	.6
7	2.4	2.1	.6
8	2.6	2.3	.8
9	2.5	2.3	.6
10	2.65	2.1	.6
11	2.6	2.2	.7
12	2.4	2.15	.5
13	2.5	2.0	.55
14	2.7	2.1	.45
15	2.3	2.0	.6
16	2.4	2.0	.6
17	2.4	2.1	.55
18	2.45	2.2	.6
19	2.4	2.1	.6
20	2.6	2.1	.7
21	2.35	2.1	.7
22	2.5	2.3	.5
23	2.3	2.1	.8
24	2.45	2.15	.7

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

DOUBLE-EDGED HORSE-PISTOL

Number	Back-Edge	Side-Side	Thickness
12107-1	2.95	2.3	.9
2	2.8	2.3	.9
3	2.85	2.3	.9
4	2.6	2.3	.75
5	2.85	2.4	.75
6	2.8	2.4	.7
7	2.8	2.4	.7
8	2.8	2.25	.85
9	2.9	2.3	.7
10	2.7	2.35	.65
11	2.9	2.2	.6
12	2.8	2.3	.6
13	2.7	2.3	.7
14	2.85	2.35	.7
15	2.9	2.3	.5
16	2.8	2.4	.7
17	2.7	2.25	.95
18	2.45	2.3	.7
19	2.25	2.6	.8
20	2.7	2.2	.8
21	2.8	2.3	.7
22	2.5	2.5	.6

SECOND HORSE-PISTOL

12104-1	2.5	2.7	.65
2	2.55	2.6	1.0
3	2.5	2.1	.6
4	2.5	2.5	.8
5	2.8	2.15	.6
6	2.9	2.45	.8
7	2.8	2.3	.7
8	2.6	2.6	.6
9	2.65	2.55	.45
10	2.6	2.75	.6
11	2.9	2.15	.65
12	2.6	2.45	.8
13	2.8	2.25	.6
14	2.7	2.5	.5
15	2.6	2.3	.5
16	2.5	2.6	.75
17	2.6	2.3	.55
18	2.5	2.45	.8
19	2.75	2.5	.8
20	2.7	2.45	.8
21	2.4	2.65	.5
22	2.45	2.6	.7

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

SECOND HORSE-PISTOL - Continued

Number	Back-Edge	Side-Side	Thickness
12104-23	2.65	2.35	.75
24	2.8	2.45	.7
25	2.6	2.5	.7
26 Incorrectly identified, see RIFLE.			

COMMON HORSE-PISTOL

Number	Back-Edge	Side-Side	Thickness
12105-1	2.55	2.3	.8
2	2.5	2.4	.6
3	2.7	2.6	.6
4	2.5	2.1	.75
5	2.45	2.35	.75
6	2.45	2.45	.75
7	2.85	2.5	.6
8	2.65	2.35	.6
9	2.3	2.3	.7
10	2.4	2.45	.7
11	2.3	2.3	1.0
12	2.4	2.5	.8
13	2.4	2.4	.65
14	2.45	2.25	.65
15	2.3	2.5	.8
16	2.9	2.2	.8
17	2.7	2.55	.7
18	2.7	2.3	1.0
19	2.5	2.3	.9
20	2.6	2.4	1.0
21	2.35	2.65	.65
22	2.65	2.55	.8
23	2.35	2.75	.7
24	2.45	2.4	.4
25	2.5	2.4	.8
26	2.65	2.5	.6

CHALK-HEEL HORSE-PISTOL

Number	Back-Edge	Side-Side	Thickness
12095-1	2.55	2.4	1.05
2	2.45	2.4	.9
3	2.75	2.65	1.0
4	2.6	2.2	.95
5	2.35	2.2	.8
6	2.5	2.6	.85
7	2.4	2.45	1.0
8	2.75	2.35	.95
9	2.3	2.45	1.1
10	2.7	2.25	.95
11	2.4	2.6	1.2
12	2.75	2.45	.8

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

CHALK-HEEL HORSE-PISTOL - Continued

Number	Back-Edge	Side-Side	Thickness
12095-13	2.6	2.35	.95
14	2.5	2.55	1.2
15	2.4	2.5	1.05
16	2.7	2.2	1.0
17	2.75	2.55	1.05
18	2.85	2.4	1.15
19	2.6	2.5	.8
20	2.6	2.45	.8
21	2.75	2.45	1.0
22	2.7	2.3	.9
23	2.4	2.5	.9
24	2.5	2.4	.9
25	2.7	2.6	1.1

GRAY HORSE-PISTOL

12094-1	2.5	2.5	.9
2	2.65	2.6	.9
3	2.7	2.3	1.0
4	2.7	2.4	.55
5	2.5	2.65	.9
6	2.5	2.5	.6
7	2.8	2.25	.8
8	2.6	2.55	.9
9	2.45	2.55	.8
10	2.65	2.6	.6
11	2.7	2.3	.8
12	2.5	2.5	.5
13	2.4	2.45	.7
14	2.6	2.55	1.0
15	2.3	2.65	.8
16	2.5	2.5	1.1
17	2.7	2.75	.8
18	2.45	2.6	.95
19	2.3	2.3	.8
20	2.6	2.6	1.0
21	2.8	2.2	.6
22	2.2	2.5	.6
23	2.8	2.6	.6
24	2.6	2.3	.4
25	2.6	2.5	.75
26	2.5	2.65	.4

DOUBLE-EDGE CARBINE

12096-1	3.3	2.5	.7
2	3.1	2.5	.9
3	3.2	2.45	.7

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

DOUBLE-EDGE CARBINE - Continued

Number	Back-Edge	Side-Side	Thickness
12096-4	3.05	2.65	.9
5	3.2	2.5	.9
6	3.2	2.6	.6
7	3.2	2.5	.6
8	3.1	2.5	.8
9	3.15	2.5	.7
10	3.15	2.6	.6
11	3.2	2.4	.95
12	3.1	2.6	.9
13	3.35	2.45	.65
14	3.15	2.5	1.0
15	3.1	2.5	.7
16	3.15	2.55	.65
17	3.15	2.5	.45
18	3.3	2.4	.75
19	3.15	2.6	.95
20	3.15	2.7	.8
21	3.2	2.55	.7
22	3.2	2.6	.7
23	3.2	2.6	1.05
24	3.1	2.5	.6
25	3.3	2.5	.95

SECOND CARBINE

12088-1	3.1	2.75	.55
2	3.0	2.5	1.0
3	3.3	2.7	.75
4	3.25	2.6	.8
5	3.25	2.5	.55
6	3.0	2.6	.7
7	3.2	2.45	.85
8	3.3	2.6	.65
9	3.3	2.6	1.0
10	2.95	2.7	.9
11	3.25	2.55	1.0
12	3.45	2.4	.7
13	3.25	2.55	.8
14	3.25	2.4	.7
15	3.2	2.55	.7
16	3.1	2.3	.9
17	3.35	2.6	.8
18	3.4	2.45	.7
19	3.25	2.55	.55
20	3.3	2.6	.7
21	3.15	2.6	.7
22	3.35	2.45	.75
23	3.0	2.75	.75
24	3.3	2.6	.7
25	3.3	2.4	.8

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

COMMON CARBINE

Number	Back-Edge	Side-Side	Thickness
12097-1	3.1	2.85	.9
2	3.0	2.9	.8
3	3.2	2.55	1.1
4	3.2	2.45	.8
5	3.2	2.6	1.15
6	3.25	2.55	.9
7	3.1	2.7	1.15
8	3.2	2.6	.6
9	3.2	2.5	1.5
10	3.15	2.4	1.4
11	3.3	2.5	.9
12	2.9	2.8	1.1
13	3.2	2.55	1.0
14	3.3	2.8	.95
15	3.1	2.75	.8
16	2.9	2.85	.8
17	3.2	2.4	1.15
18	2.75	3.05	.9
19	2.8	3.0	.8
20	2.75	2.95	.9
21	3.2	2.3	1.2
22	3.05	2.75	1.2
23	3.05	2.6	.95
24	2.9	2.75	1.0
25	3.4	2.6	1.1

CHALK-HEEL CARBINE

12093-1	3.45	3.2	1.4
2	3.5	2.95	1.4
3	3.25	2.9	1.4
4	3.4	2.95	.9
5	3.35	2.95	1.5
6	3.4	3.1	1.4
7	3.6	2.9	1.45
8	3.2	3.0	1.4
9	3.3	2.85	1.1
10	2.9	2.5	1.15
11	3.25	2.8	1.6
12	3.3	2.8	1.4
13	3.1	2.5	.9
14	3.3	2.7	1.15
15	3.3	2.9	1.1
16	3.35	2.9	1.25
17	3.25	2.75	1.2
18	3.3	2.75	1.2
19	3.3	2.95	1.35
20	2.9	2.45	1.0

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

CHALK-HEEL CARBINE - Continued

Number	Back-Edge	Side-Side	Thickness
12093-21	3.3	2.85	1.2
22	3.4	2.85	1.3
23	3.15	2.95	1.1
24	3.6	3.05	1.35
25	3.45	2.75	1.25
26	3.4	2.9	1.15
27	3.05	2.8	1.4

GRAY-CARBINE

12100-1	3.2	2.5	1.0
2	3.3	2.5	.8
3	3.2	2.8	.95
4	2.95	2.95	.5
5	3.0	2.35	1.4
6	3.3	2.75	.9
7	3.1	2.5	1.0
8	3.05	2.45	.75
9	3.2	2.45	1.1
10	3.3	2.65	.65
11	3.2	2.4	.9
12	3.15	2.55	.8
13	3.45	2.7	1.1
14	3.3	2.45	.75
15	3.3	2.65	.75
16	3.1	2.7	.8
17	3.0	2.65	.8
18	3.1	2.4	1.0
19	3.3	2.7	1.1
20	3.3	2.7	.9
21	3.05	2.6	.7
22	3.3	2.6	1.15
23	3.2	2.65	1.0
24	3.0	2.55	1.25

DOUBLE-EDGE MUSKET

12101-1	3.55	3.0	.9
2	3.55	2.9	1.1
3	3.5	3.0	.8
4	3.7	2.8	1.2
5	3.6	2.9	1.0
6	3.2	2.6	.9
7	3.8	2.8	1.1
8	3.5	2.95	1.1
9	3.6	2.85	.9
10	3.5	2.95	.75
11	3.55	2.9	.85

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

DOUBLE-EDGE MUSKET - Continued

Number	Back-Edge	Side-Side	Thickness
12101-12	3.5	2.8	.75
13	3.6	2.85	.8
14	3.4	2.9	.9
15	3.6	2.85	.65
16	3.55	2.8	1.0
17	3.45	2.9	1.0
18	3.7	2.9	.8
19	3.7	3.0	.95
20	3.5	2.9	1.1
21	3.5	2.9	.8
22	3.55	2.9	.95
23	3.7	2.95	1.0
24	3.7	2.9	.85
25	3.7	2.9	.9
26	3.6	2.8	.7

SECOND MUSKET

12091-1	3.3	2.9	.9
2	3.45	2.75	1.05
3	3.4	2.8	1.0
4	3.55	3.1	1.1
5	3.15	2.9	.8
6	3.3	2.7	.8
7	3.4	2.7	.7
8	3.35	2.8	.8
9	3.25	2.8	.9
10	3.4	2.9	.7
11	3.6	2.85	1.0
12	3.5	2.8	1.2
13	3.6	2.8	1.0
14	3.5	3.0	1.0
15	3.4	3.0	1.1
16	3.8	3.2	1.15
17	3.25	2.85	1.2
18	3.5	3.0	1.2
19	3.5	2.7	.95
20	3.3	2.85	.7
21	3.4	2.9	1.0
22	3.5	2.7	.85
23	3.5	3.0	1.05
24	3.4	2.9	1.0
25	3.35	3.0	1.0

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

COMMON MUSKET

Number	Back-Edge	Side-Side	Thickness
12106-1	3.4	3.1	1.4
2	3.35	2.85	1.5
3	3.6	2.9	1.3
4	3.3	2.75	1.4
5	3.4	2.8	1.55
6	3.15	3.0	1.45
7	3.1	2.8	1.5
8	3.4	3.0	1.3
9	3.5	2.7	1.4
10	3.3	2.7	1.45
11	3.1	2.85	1.4
12	3.2	2.9	1.3
13	3.5	3.0	1.4
14	3.3	2.8	1.7
15	3.3	2.8	1.2
16	3.4	2.9	1.4
17	3.4	2.9	1.3
18	3.45	2.7	1.3
19	3.4	2.9	1.2
20	3.2	3.0	1.5
21	3.15	2.8	1.5
22	3.4	2.8	1.45
23	3.3	2.8	1.4
24	3.4	2.8	1.4
25	3.35	2.9	.9

CHALK-HEEL MUSKET

Number	Back-Edge	Side-Side	Thickness
12098-1	2.9	2.8	1.0
2	3.2	2.85	.8
3	3.25	2.5	1.0
4	2.95	2.55	.9
5	3.1	2.45	.9
6	3.1	2.6	.85
7	3.1	2.3	.85
8	3.15	2.4	.8
9	3.2	2.4	.8
10	3.25	2.5	1.0
11	3.1	2.5	1.1
12	3.35	2.6	1.0
13	3.2	2.5	1.5
14	3.45	2.5	.8
15	3.2	2.55	1.0
16	3.1	2.5	1.2
17	2.6	2.8	1.0
18	3.25	2.5	1.1
19	3.0	2.3	.8
20	3.3	3.05	1.4
21	3.1	2.6	1.25
22	3.05	2.8	1.0

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

GRAY MUSKET

Number	Back-Edge	Side-Side	Thickness
12102-1	3.7	3.05	1.1
2	3.4	2.85	1.3
3	3.3	2.9	1.3
4	3.4	2.9	1.25
5	3.35	2.8	1.2
6	3.3	2.9	1.2
7	3.2	3.0	.75
8	3.4	2.8	1.35
9	3.5	3.05	1.3
10	3.4	2.9	1.5
11	3.5	3.0	1.0
12	3.2	2.9	1.15
13	3.3	2.95	1.4
14	3.4	2.9	1.4
15	3.2	2.8	1.4
16	3.3	2.75	1.3
17	3.6	2.8	1.2
18	3.4	2.85	1.0
19	3.35	3.0	1.25
20	3.4	3.0	1.0
21	3.6	2.9	1.1
22	3.1	3.2	1.0
23	3.3	2.9	1.1
24	3.4	2.8	1.3
25	3.4	2.75	1.4

TINDER-BOX

12103-1	3.65	3.0	1.2
2	3.75	3.0	1.5
3	3.6	3.0	1.0
4	3.7	3.2	1.0
5	3.9	3.2	1.2
6	3.7	3.2	1.25
7	3.65	3.2	1.05
8	3.9	3.35	1.0
9	4.2	3.4	1.3
10	3.8	3.3	1.0
11	3.7	3.0	1.1
12	4.85	3.5	1.2

	Long Axis	Short Axis	Thickness
13*	5.1	4.25	1.6

*Number 12103-13 is an oval, reworked core rejuvenation flake (See Witthoft 1966:37).

HENRY C. MERCER BRANDON GUNFLINT COLLECTION

SPINDLE

Number	Back-Edge	Side-Side	Thickness
12099-1	2.65	2.6	.75
2	2.6	2.6	.75
3	2.7	2.6	1.85
4	2.7	2.5	1.1
5	2.6	2.6	1.0
6	2.6	2.65	.7
7	2.7	2.5	.8
8	2.6	2.7	.8
9	2.7	2.6	.8
10	2.6	2.7	.85
11	2.55	2.7	.9
12	2.6	2.65	.85
13	2.7	2.6	.85
14	2.7	2.8	.75
15	2.6	2.5	1.0
16	2.7	2.65	.95
17	2.65	2.55	.7
18	2.6	2.55	.85
19	2.8	2.5	1.0
20	2.6	2.7	.8
21	2.6	2.7	.8
22	2.6	2.6	.7
23	2.7	2.35	.8
24	2.7	2.7	.8
25	2.5	2.6	.8

RANGE

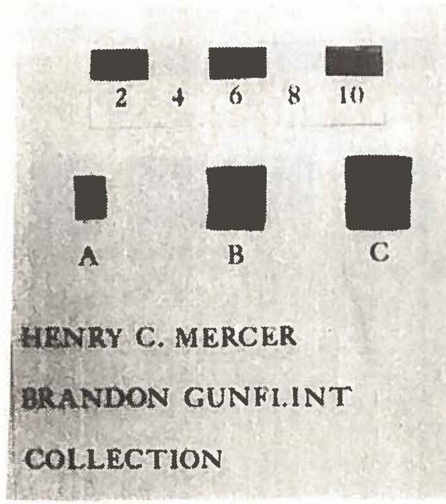
Type and Class	Number	Range Back-Edge	Side-Side	Thickness
Pocket-pistol	40	1.2 -1.8	.7 -1.4	.2 - .6
Rifle	24*	1.8 -2.35	1.6 -2.1	.35- .8
Singlegun	24	2.3 -2.7	1.9 -2.3	.45- .8
Double-edge Horse-pistol	22	2.25-2.95	2.2 -2.6	.5 - .95
Second Horse-pistol	25*	2.4 -2.9	2.1 -2.75	.5 -1.0
Common Horse-pistol	26	2.3 -2.9	2.1 -2.75	.4 -1.0
Chalk-heel Horse-pistol	25	2.3 -2.85	2.2 -2.65	.8 -1.2
Gray Horse-pistol	26	2.2 -2.8	2.2 -2.75	.4 -1.0
Double-edge Carbine	25	3.05-3.35	2.4 -2.7	.45-1.0

RANGE - Continued

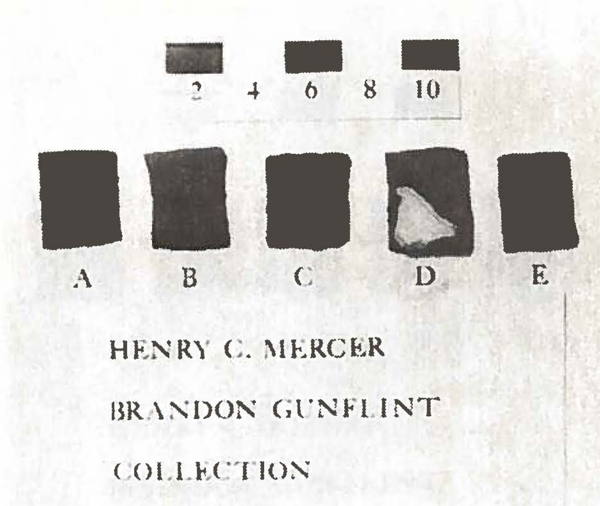
Type and Class	Number	Range Back-Edge	Side-Side	Thickness
Second Carbine	25	2.95-3.45	2.3 -2.75	.55-1.0
Common Carbine	25	2.75-3.4	2.3 -3.05	.6 -1.5
Chalk-heel Carbine	27	2.9 -3.6	2.45-3.2	.9 -1.6
Gray Carbine	24	2.95-3.45	2.35-2.95	.5 -1.4
Double-edge Musket	26	3.2 -3.8	2.6 -3.0	.65-1.2
Second Musket	25	3.15-3.8	2.7 -3.2	.7 -1.2
Common Musket	25	3.1 -3.6	2.7 -3.1	.9 -1.7
Chalk-heel Musket	22	2.6 -3.45	2.3 -3.05	.8 -1.5
Gray Musket	25	3.1 -3.7	2.75-3.2	.75-1.4
Tinder-box	12+	3.6 -4.35	3.0 -3.5	1.0 -1.5
Spindle	25	2.5 -2.8	2.35-2.8	.6 -1.85

*One flint, which was incorrectly identified as a second horse-pistol, has been, for the purposes of this study, identified as a rifle.

+One tinder-box flint made out of a core rejuvenation flake has, for the range, median, and mean, been disregarded.



1. A. Pocket Pistol Gunflint B. Rifle Gunflint
   C. Single Gun Gunflint



2. Horse-Pistol Gunflints
   A. Double-Edge B. Second C. Common
   D. Chalk-Heel E. Gray

Scale in Centimeters

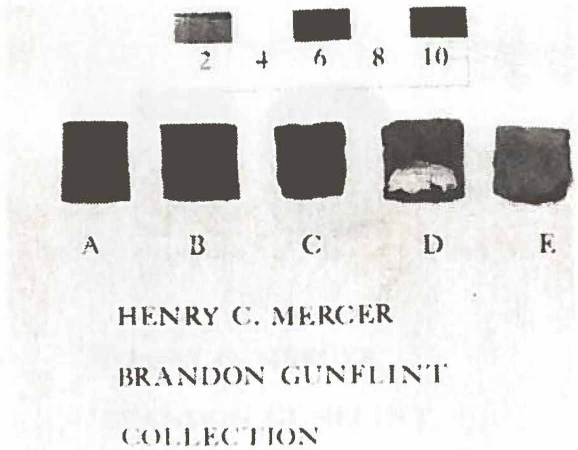


Figure 3. Carbine Gunflints
A. Double-Edge B. Second C. Common
D. Chalk-Heel E. Gray

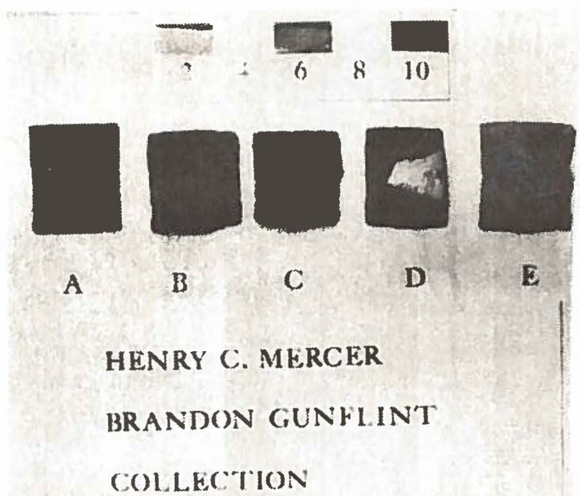


Figure 4. Musket Gunflints
A. Double-Edge B. Second C. Common
D. Chalk-Heel E. Gray

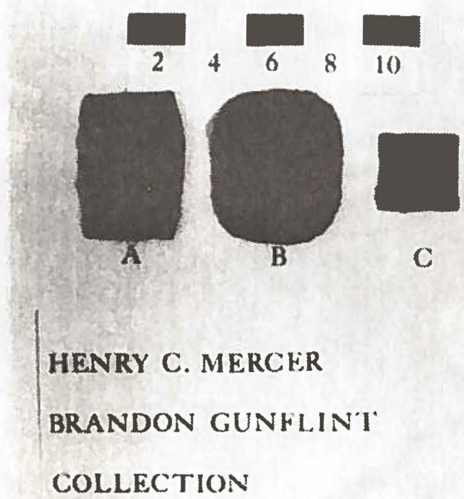


Figure 5. A. Tinder Box Flint B. Tinder Box made from Core Rejuvenation Flake C. Spindle Flint

[redacted]

Figure 8. Knapping of the Flints from the Blade. The tools shown are a knapping hammer, or flaker (See Letter H under Tools), an iron stake (Letter I) and a wooden stake rest (Letter J). The blade has been struck with the hammer in order to break off individual flints. The gunflints in the foreground, resting on the stump, are completed musket flints.

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AN IMPORTANT CERAMIC DISCOVERY AT THE ROBBINS FARM SITE (7K-F-12)

Frederica, Delaware

Faye L. Stocum

The Robbins Farm Site, 7K-F-12, is located just north of Frederica on the north side of Spring Creek, west of U.S. Route 113 on the Luther Robbins property. (Plate 1). The area in which the site is located, characterized by well-drained soils adjacent to a tidal creek and marsh, is an ideal location for aboriginal occupation. This multicomponent site has been collected over the years by numerous amateurs, most notably the late H. Geiger Omwake, as well as the Section of Archaeology.

Attention given to the Robbins Farm Site, over the past four years, had been for the proposed Dover By-Pass which was slated to envelope a major portion of the site. The By-Pass project has been subsequently abandoned; thus, preserving at least temporarily, much valuable archeological data for future research. Renewed interest in 7K-F-12 occurred in June 1975 when an agreement was drawn up between the Department of Highways and Transportation and the Section of Archaeology to conduct preliminary site examination and necessary salvage work within the Right-of-Way (ROW) for the dualization of U.S. Route 113, Frederica to Little Heaven. Within this ROW a small segment of the Robbins Farm Site was transected. While walking survey was performed along the entire ROW, efforts were predominantly concentrated on stripping-salvage procedures at 7K-F-12 in order to maximize information and minimize interference with the construction operations which were underway. With the invaluable aid of machinery and operators from the contracting agency, Warren Construction Company, Dover, the ROW transecting the Robbins Farm was stripped to subsoil. This action revealed several disturbances. Examination of these disturbances resulted in the discovery of: four trees, one unidentifiable, non-aboriginal feature and an exhausted aboriginal storage-refuse pit.

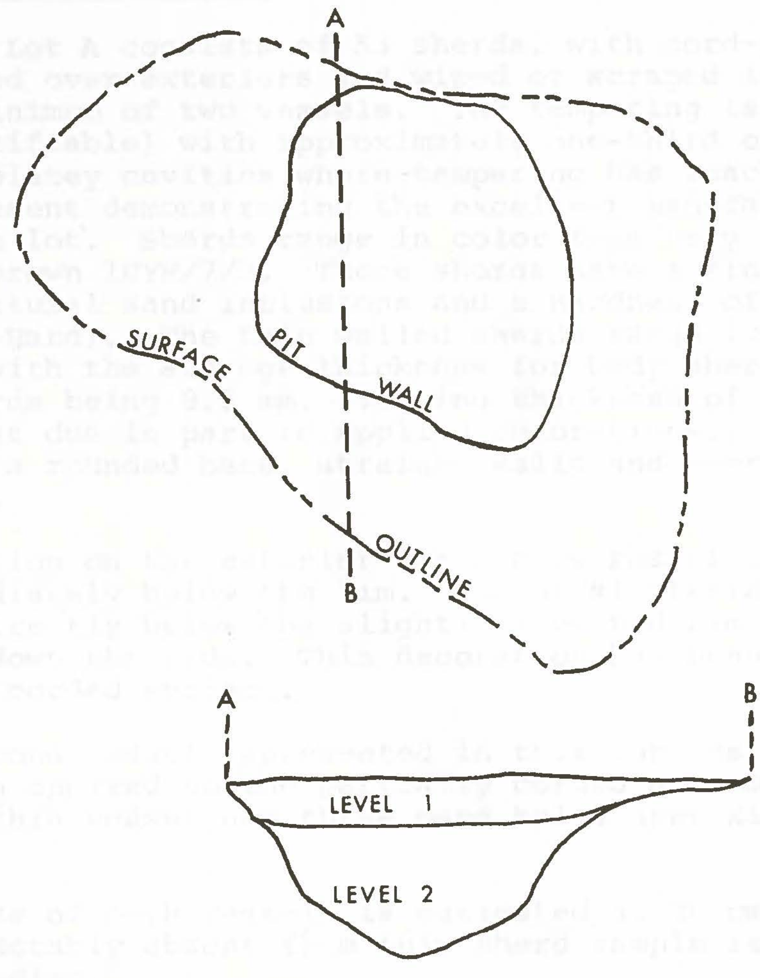
Feature Analysis

Feature 1 (Figure 1)

Outline:	Oval
Cross-section:	Basin-shaped, conical bottom
Dimensions:	100 x 80 x 40 cm with disturbed top outline

Contents: What has been designated as level one is that which remains of the dispersed top of the refuse pit disturbed during recent agricultural activities. This level or lens was filled with sandy orange subsoil containing flecks of charcoal. This is underlain by level two, a distinct, dark organic-charcoal stained lens. It is in this level that 2,083 oysters, 2 clams and a trace of mussel shell were taken. It is also in this shell lens that the bulk of the artifacts were recovered. These include:

36	Heat-altered rock fragments	1461.9 g/wt
15	Flakes (2 quartz, 13 pebble jasper)	17.1 g/wt
1	Pebble core (flakes removed)	7.4 g/wt
1	Unidentified long bone fragment	1.5 g/wt
1	Right mandibular fragment of a mature small canine	5.2 g/wt
109	Sherds pottery	574.7 g/wt



SCALE 1cm:20cm

FIGURE 1

Discussion: This feature appears to have been a former storage pit, reused as a refuse pit. The deposition and contents indicate a short term usage. The artifact content within the fill, distinguished into two levels - shell vs. non-shell, is homogeneous. No tools were present. The only indication of aboriginal activity is the procurement and processing of shell food resources. The significance of the canine mandibular fragment is unknown.

Ceramic Analysis

The ceramics, 109 sherds (10 rim, 99 body and basal sherds), weighing 574.7 grams, were first separated into classes on the basis of temper. These classes were then subdivided on the attribute of surface treatment, that is, cord-marked, smoothed, etc. When considering these as basic criteria for devising ceramic groups or clusters, ancillary attributes such as mode of manufacture, thickness and texture of paste, were noted as well and included as part of the description. These ceramic clusters or lots were then compared/contrasted to established ceramic types found in the literature.

Lot A: 53 sherds (Plate 2)

Description: Lot A consists of 53 sherds, with cord-paddled malleated and/or smoothed over exteriors and wiped or scraped interiors, representing a minimum of two vessels. The tempering is crushed unburnt shell (unidentifiable) with approximately one-third of the sherds showing only the platey cavities where tempering has leached out. No coil breaks are present demonstrating the excellent manufacture of this coiled ceramic lot. Sherds range in color from very dark gray 2.5R/3/0 to very pale brown 10YR/7/3. These sherds have a fine, compact paste with minute natural sand inclusions and a hardness of 2.5 - 3.0 Moh's scale (Medium-Hard). The thin walled sherds range from 4 mm to 10 mm in thickness with the average thickness for body sherds being 5.5 MM and basal sherds being 9.5 mm. Varying thickness of 4 mm to 8 mm on rimsherds exist due in part to applied decorations. Vessel shape is globular with a rounded base, straight walls and everted or slightly inverted rims.

Decoration on the exterior surface is restricted to the rim or the area immediately below the rim. Vessel #1 displays diagonal cording applied directly below the slightly inverted rim extending approximately 20 mm down the side. This decoration has been applied over a smoothed-over corded surface.

The second vessel represented in this lot has a dowel-impressed rim decoration applied to the partially corded and smoothed-over corded body. Also, this vessel has three mend holes approximately 25 mm below the rim.

The size of both vessels is estimated at 20 cm in diameter and 25 cm deep. Notably absent from this sherd sample is any indication of lugs or handles.

Cultural Affiliation: In Delaware this ceramic type is unique to the Robbins Farm Site. This lot maintains strong ties with the type defined by Griffin in Manson, et al (1944) as Keyser Cord Marked found in Maryland and Virginia.

The description of Keyser Farm Ware and the various decorations applied to the Keyser Cord-Marked type suggests to this author that the recovered Lot A ceramics are in fact of this type and not a local variant. The type site for this ceramic type is the Keyser Farm Site, located in the Piedmont area, south of Front Royal, Virginia on the South Fork of the Shenandoah River. This ceramic type and variants thereof have also been found along the Potomac River at sites such as the Hughes Site (Stearns, 1940) and Accokeek Creek Site (Stephenson, 1963); therefore, indicating a wide distribution. The discovery of this ceramic type at the Robbins Farm reaffirms this.

The temporal bracketing of this ceramic type has been relative. Estimates given by Manson, et al (1944:413), Stearns (1940:14) and Stephenson, et al (1963:129) place its popularity during the Late Woodland. Griffin in Manson, et al, suggests a date of 1550 - 1650 A.D. for the occupation of the Keyser Farm Site.

Lot B: 56 sherds (Plate 3)

Description: Lot B consists of 56 sherds, which have cord-paddled malleated and/or smoothed over exterior surfaces with wiped or smoothed interiors. At minimum, there is represented here, two vessels; perhaps three. The tempering is coarse grain sand or finely crushed quartz. The paste is fine and compact with very fine sand inclusions as a natural component of the clay. Hardness ranges from 2.5 - 3.5 (Hard) on the Moh's scale. The mode of manufacture is coiling with only one coil break present. Sherds range in thickness from 4.5 mm to 7 mm (no basal sherds present) with the average wall thickness being 6 mm. The extremely thin walls, the scale of hardness and the coil break demonstrates a well constructed ceramic lot. Sherds range from dark gray 7.5 YR/3/0 through reddish-yellow 7.5YR/7/6 to light reddish-brown 5YR/6/4.

Vessel shape is globular. Judging from the curvature of the lower body sherds, the base is probably round. The walls are straight and the two rim sherds are straight. No evidence of mending, as was present in Lot A, was noted.

Decorations applied over the corded and smoothed-over cording is restricted to the upper one-quarter of the vessel. It varies from horizontal rows of direct cording applied just below the rim; diagonal, horizontal and perhaps vertical incising beginning on and below the rim; to vertical incising separated by thumb nail impressions.

Cultural Affiliation: This ceramic lot is similar to a vessel excavated from a Late Woodland component at the Island Field Site, 7K-F-17. This is the only other recognized location in Delaware for this pottery so far. Cultural affiliations exist for this ceramic lot which place it into the Potomac Creek Ware, (Holmes:1903, Schmitt:1952, Stephenson, et al:1963, Manson, et al:1944). It is difficult however, in many instances to determine if many of the non-decorated body sherds belong to the Potomac Creek Cord-Impressed or Potomac Creek Plain type. It is surmised that the bulk, if not all sherds, are of the cord-impressed type which maintains as one recognized surface treatment of the smoothed-over cording while limiting decoration to the rim and sub-rim portion of the vessel.

This ceramic ware was discovered at the Potomac (Patawomeke) Creek Site on the Potomac Creek in Stafford County, Virginia, as well as at the Keyser Farm Site. At the Accokeek Creek Site, Potomac Creek ware was found. However, unlike those found at the Keyser Farm Site, Potomac Creek or Robbins Farm, rim sherds were noted as distinctly flared. This may be a local variation for this type.

The temporal placement for this Potomac Creek Cord-Impressed, as it is found associated with the Keyser Cord-Marked ceramics, is estimated at 1550 - 1650 A.D., the very Late Woodland.

Discussion

This storage/refuse pit of rather short-term usage, should not be considered representative of the entire Late Woodland component at the Robbins Farm Site. More excavation is required to expand upon the environmental exploitation-adaptation, accompanying settlement pattern and the potential ramifications this discovery has on what is known to-date about the Late Woodland in Delaware.

Another important point worthy of mention is the physical nature of known sites containing Potomac Creek and Keyser Farm ceramics. Typical sites, such as Keyser Farm, Potomac (Patawomeke) Creek, Hughes, and Accokeek Creek where these ceramics have been found are large communities. These sites have numerous features, such as large storage pits and refuse pits, burials and even ossuaries; the indication being an intense, long-term occupation. This is the antithesis of the Robbins Farm Site as we know it thus far. Past investigations support this. During the Dover By-Pass Project, intensive surface surveys conducted at Robbins Farm revealed only two small sherds of Middle Woodland (Mockley Ware ceramics) for the entire site. Amateur collections are likewise void of ceramics. Although the excavation of this singular feature is not a representative sample of the site, the lack of surface materials seemingly indicates this component was not of great intensity or duration.

The Potomac Creek vessel found at the Island Field Site was found approximately 15 feet from a semi-subterranean house structure. In this structure, excavation revealed Townsend Series Ceramics. Also, under the central fire hearth, an adult male which Neuman and Murad (1970) relates osteologically to the Slaughter Creek Phase people, was found. The ceramic association with this small hamlet occupation is not firm, merely suggested (Thomas, personal communication). If this association is valid, it must also be pointed out that the occupation is not of the magnitude found to the west.

The Late Woodland Period in southern Delaware is characterized by the influence of the Slaughter Creek Phase people. According to the trait-list description and suspected duration of the Slaughter Creek Phase (Thomas, 1973:51), the appearance of this unique intrusion of Piedmont and Potomac Tidewater ceramics at a time when only Townsend Series Ceramics are to be anticipated suggests a re-examination of this Period is necessary.

From the Robbins Farm excavation, it appears that there could be a shift in the geographical range of the Slaughter Creek Phase people. Likewise it is possible that they are displaced by or amalgamating with a westerly Late Woodland culture. Moreover, it is known that during the Late Woodland, influence is exerted from the Potomac onto the Delmarva. This is apparent in the similarities of ceramic decoration between Townsend Series Ceramics, expecially Townsend Corded Horizontal, and the Potomac Creek Ware.

Alternately, there are indications from archaeological materials throughout the area that there is a shrinking range of Slaughter Creek Phase sites, being concentrated in Sussex County. Thus, a new, undefined phase may be arising, characterized by a distinct westerly influence, in this portion of Delaware.

Within this short expose it must be asked: "What brought about this radical implantation of new ceramic types?" At the Robbins Farm Site, there is no mixture with indigenous Townsend Series Ceramics; nor is there any recognized attempt to incorporate selected ceramic attributes of one ceramic type onto the others during manufacture.

It is apparent that there is a need for future research to answer such questions as: "What are the circumstances to this intrusive ceramic lot being present at the Robbins Farm Site and possibly the Island Field Site?" "Is this a unique phenomenon?" "Is there a population shift from the west?" "How does this effect the indigenous population and our understanding of them?" "What sort of communication mechanism (i.e. trade, migration, social exchange) and cultural processes are operating during the very Late Woodland?" Future research will hopefully bring some answers.

****

Author's Note: It is requested by the Section of Archaeology, that anyone who suspects they have ceramics similar to those found at the Robbins Farm Site, please bring it to our attention. Thank you.

F.L.S.

(A)

(B)

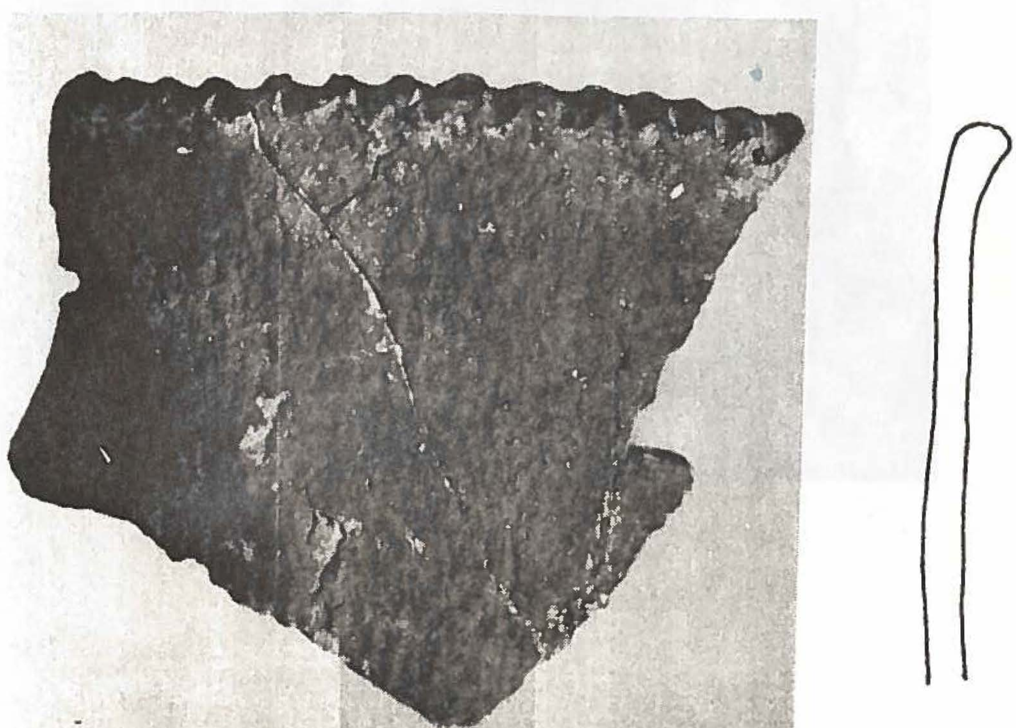


PLATE 1: KEYSER CORD MARKED CERAMICS

(A) VESSEL 1 RIMSHERD

(B) VESSEL 2 RIMSHERD

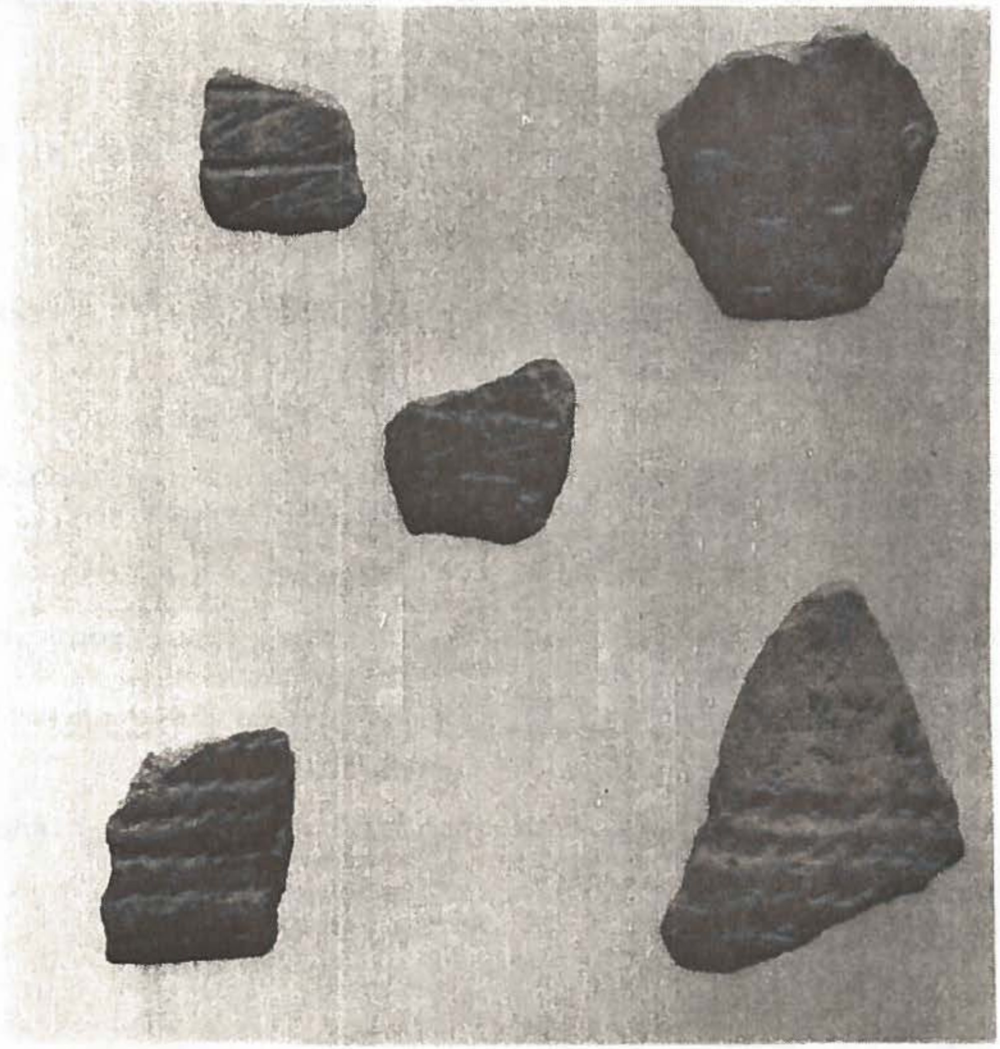


PLATE 2: POTOMAC CREEK CORD IMPRESSED CERAMICS

RADIO CARBON DATES OF THE WOODLAND PERIOD FROM THE DELMARVA PENINSULA

Ronald A. Thomas

In recent years, a relatively large number of radio-carbon dates have been obtained by archaeologists working in the Delmarva Peninsula. These dates, when considered as a group, have aided in clarifying the sequence of cultural manifestations occurring on the Delmarva Peninsula during the last ten thousand years. Most dates, unfortunately, have not been published or discussed in detail and, consequently, have proven to be of little use to avocational archaeologists working in the area or to professional archaeologists of neighboring regions (Figure 1).

This report is intended as a survey of dates presently available from archaeological contexts associated with the Woodland Period of the Delmarva Peninsula. While earlier dates exist, they usually do not have significant associations that can be related to known cultural complexes. The dates will be expressed in years Before Present (B.P.) as calculated using the 5570 year half-life of radiocarbon. The dates can be converted to the more accurate 5730 year half-life figures by multiplying the given figure by a factor of 1.03. Calendrical dates are also presented.

<u>Slaughter Creek Phase</u> (Figure 2)

A series of six dates are now available in contexts which suggest association with the previously described Slaughter Creek Phase (Thomas 1975) of the lower Delmarva Peninsula. The Slaughter Creek Phase has traditionally been characterized by crude triangular stone pointed tools, bone tools of domestic uses, Townsend Ware ceramics, ossuary and pit burials and a shell fishing oriented economy. Recent investigations by the Section of Archaeology, State of Delaware, have led to a much better understanding of the cultural manifestation and have suggested that the phase can be sub-divided into two or more divisions.

In their discussion of two late and dissimilar semi-subterranean dwelling types, Griffith and Artusy (1975) pointed out that the ceramic contents associated with each type differ. The 1370 A.D. date shown on the following page for the Poplar Thicket site was obtained from charcoal gathered during the excavation of a semi-subterranean house which contained ceramics of the decorated type, Townsend Corded-Horizontal and the plain type, Rappahannock Fabric Impressed. This same type of decorated ceramics has also been found in the same context at other Sussex County sites.

The remaining radio-carbon dates listed were from carefully excavated features also containing Townsend ceramics. The decorated pottery in these situations, however, were of the Rappahannock Incised type and not of the Townsend Corded-Horizontal type. Although the two decorative types often occurred on the same site, they never appeared in certain association. It has been suggested (Griffith and Artusy, M.S.[1]) that the sequence shown here, i.e., incised to corded decorations, holds true for most of Delaware's Atlantic Coast. Additional samples from features containing corded ceramics are being prepared for submission.

In all features producing dated material, the predominant evidence of cultural activity was the numerous shells relating to countless meals of oyster, clam, whelk, scallop, etc. Also associated were bone of deer and various small mammals, fish, bird and often hickory nut hulls. The majority of the lithic material was discard flakes but triangular tools, fire-cracked rock and occasional hammerstones were also found. Crudely notched projectile points may or may not be intrusive from earlier occupations of the same sites.

Poplar Thicket Site UGa-924	(7S-G-22)	580 ± 60 B.P.	1370 A.D.
Warrington Site UGa-925	(7S-G-14)	665 ± 85 B.P.	1285 A.D.
Lankford 2 SI-2188	(18Do43)	715 ± 60 B.P.	1235 A.D.
Mispillion Site UGa-923	(7S-A-1)	865 ± 75 B.P.	1085 A.D.
Lankford 1 SI-2684	(18Do43)	905 ± 60 B.P.	1045 A.D.
Lankford 3 SI-2686	(18Do43)	950 ± 60 B.P.	1000 A.D.

Webb Phase (Figure 3A)

Only a single date has been obtained on the Webb Phase cemetery at the Island Field but the associations for this 740 A.D. manifestation are numerous. Basically the Webb Phase is a late Middle Woodland occupation of the Delmarva Peninsula by peoples who had a very complex social structure, who engaged in some trade with the interior areas of the eastern United States, and who seem to have lived in small hamlets where they engaged in farming, shell fishing, hunting and gathering. It is difficult to relate the Webb Phase to earlier Middle Woodland Phases although an overlap with the briefly described Oxford Complex (Thomas, et.al., 1974) does exist. Unfortunately, dates for the Oxford Complex do not yet exist.

Island Field Site I-6338	(7K-F-17)	1210 ± 90 B.P.	740 A.D.

Red Lion Site

A radio-carbon date obtained from the Red Lion Site can not be associated with a particular cultural manifestation. The date is based on charcoal samples collected from within an apparent small, circular post-hole pattern that may have represented a sleeping area. Artifacts found at the site can not be definitely associated with the feature.

Red Lion Mound I-6868	(7NC-D-36)	1325 ± 85 B.P.	625 A.D.

Carey Phase (Figure 3B & 4A)

The earliest of the cultural complexes dating from the beginning of the first millenium A.D. is the Carey Phase. It obviously dates earlier than the 625 A.D. figure obtained from the Red Lion Site. The Carey Phase series of dates are associated with a well-defined complex of cultural traits characterized by the occurrence of Mockley Ware ceramics, crude side-notched points, deer and small mammal bone debris and a seasonal shell-fishing economy. The 130 year span suggested by the radio-carbon dates for the complex will certainly be expanded by future investigations. They do, however, serve to isolate the Carey Phase from preceeding and succeeding complexes.

Wolfe Neck Midden UGa-1273a	(7S-D-10)	1620 ± 65 B.P.	330 A.D.
Wolfe Neck Midden Uga-1273b	(7S-D-10)	1625 ± 160 B.P.	325 A.D.
Hughes-Willis Site I-6060	(7K-D-21)	1650 ± 110 B.P.	300 A.D.
Carey Farm Site I-5817	(7K-D-3)	1750 ± 90 B.P.	200 A.D.

Delmarva Adena Phase (Figure 4B)

Although the Delmarva Adena Phase is described primarily as a mortuary cult, it now appears possible to associate it with a total socio-cultural system. The radio-carbon dates considered as being associated with the phase are from five sites, all of which fall between the years 785 and 240 B.C. This may be further reduced to a 265 year span if the earliest date, which is somewhat suspect, is removed from consideration.

Four dates have mortuary associations as well as ceramic associations. The Nassawango site, near Salisbury, Maryland, contained human burials with exotic goods in graves which intruded into probably contemporaneous refuse-filled pits. The St. Jones site date was from a heavy concentration of charcoal within an area restricted to mortuary use. The two Wolfe Neck site dates are associated with domestic ceramics although the site produced exotic artifacts that may have had mortuary contexts. Dill Farm Site dates were obtained from a fluvial deposit in which were found a relatively undisturbed hearth and associated ceramics.

Although it appears that several ceramic types exist and it may be possible to subdivide the phase, much as is being done with the Slaughter Creek Phase, present data is only suggestive and can not be used on which to base a major phase definition. The Wolfe Neck dates are taken from distinct strata in a buried shell midden. The associated ceramics, in all cases, range from crushed quartz tempered ware with either net-impressed or cord-marked outer surfaces to basically untempered ware with similar surface treatment. Site reports from Nassawang (Wise 1973), St. Jones (Thomas 1976), Dill (Thomas 1975) and Wolfe Neck (Griffith and Artusy m.s.[2]) can be referred to for further discussions.

Nassawango Site SI-2189	(18Wo23)	2190 ± 70 B.P.	240 B.C.
Nassawango Site SI-2190	(18Wo23)	2190 ± 100 B.P.	305 B.C.
Wolfe Neck UGa-1224	(7S-D-10)	2325 ± 65 B.P.	375 B.C.
St. Jones Y-933	(7K-D-1)	2330 ± 80 B.P.	380 B.C.
Dill Farm Site I-6886	(7K-E-12)	2330 ± 85 B.P.	380 B.C.
Nassawango Site SI-2188	(18Wo23)	2445 ± 100 B.P.	495 B.C.
Dill Farm Site I-6891	(7K-E-12)	2450 ± 85 B.P.	500 B.C.
Wolfe Neck UGa-1223	(7S-D-10)	2455 ± 60 B.P.	505 B.C.
Nassawango Site SI-2191	(18Wo23)	2735 ± 75 B.P.	785 B.C.

Summary

The addition of twenty-one radio-carbon dates to our data base concerning the Woodland Period of Delmarva prehistory has aided considerably in the construction of a cultural sequence and in the interpretation of associations, duration of cultural types and the technological development of cultural traits. It is comforting to obtain support for chronologies established on the basis of typological similarities with better known areas of the eastern United States. It is also becoming apparent, however, that the situation is much more complex than had been thought.

The earliest series of radio-carbon dates from the Delmarva Peninsula date to the middle portion of the first millenium B.C. These date what now appears to be a single cultural phase, which, with further details, may be divisible into several related phases. A very consistent series of dates is associated with Mockley Ware ceramics and aids in the understanding of the development of the Carey Phase. Several unrelated dates span the gap between the Carey Phase series and the latest series, that of the Slaughter Creek Phase. These latter dates suggest a two-fold division of the Slaughter Creek Phase based on ceramic decoration, house type, and perhaps economic factors.

The present survey serves primarily to bring to the attention of the interested public certain basic data necessary for a full investigation of Delmarva archaeology. It is apparent that with further radio-carbon dates a much more refined and accurate picture will appear.

	Historic Contact Period	
1630 A.D.		
	Slaughter Creek Phase	1370 A.D.
		1285 A.D.
	Poplar Thicket Site (7S-G-22)	1235 A.D.
	Warrington Site (7S-G-14)	1085 A.D.
	Mispillion Site (7S-A-1)	1045 A.D.
	Lankford Site (18Wo43)	1000 A.D.
900 A.D.	Webb Phase	
	Island Field Site (7K-F-17)	740 A.D.
	Red Lion Site (??) (7NC-D-36)	625 A.D.
600 A.D.		
	Oxford Complex	
400 A.D.	Carey Phase	
		330 A.D.
	Hughes-Willis Site (7K-D-12)	325 A.D.
	Carey Farm Site (7K-D-3)	300 A.D.
	Wolfe Neck Site (7S-D-10)	200 A.D.
100 A.D.		
200 B.C.	Delmarva-Adena Phase	
		240 B.C.
	Nassawango Site (18Wo23)	375 B.C.
	St. Jones Site (7K-D-1)	380 B.C.
	Wolfe Neck Site (7S-D-10)	380 B.C.
	Dill Farm Site (7K-E-12)	495 B.C.
		500 B.C.
		505 B.C.
600 B.C.		785 B.C. (?)
	Clyde Complex	

Figure 1 Radio-Carbon Dated Cultural Complexes in the Delmarva Peninsula

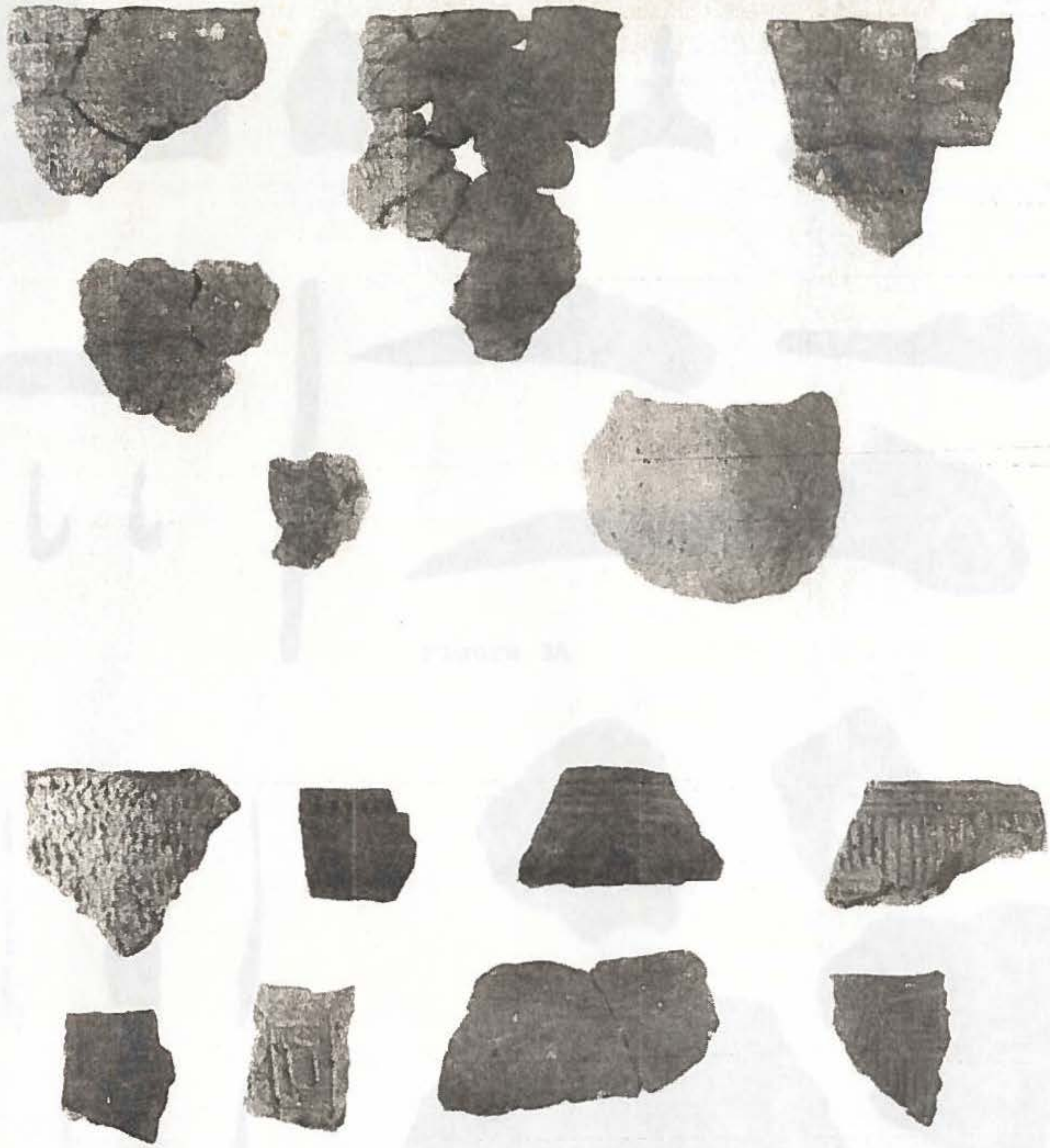


Figure 2

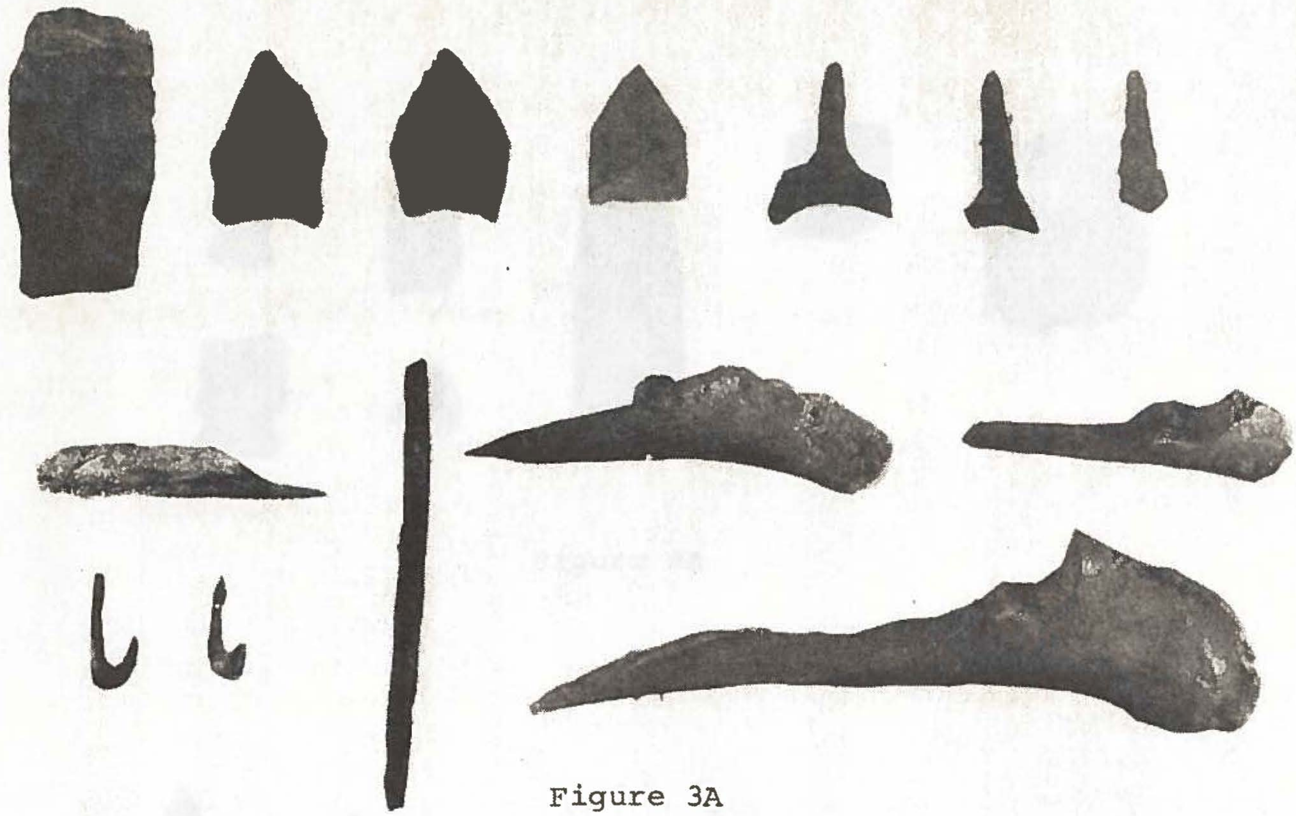


Figure 3A

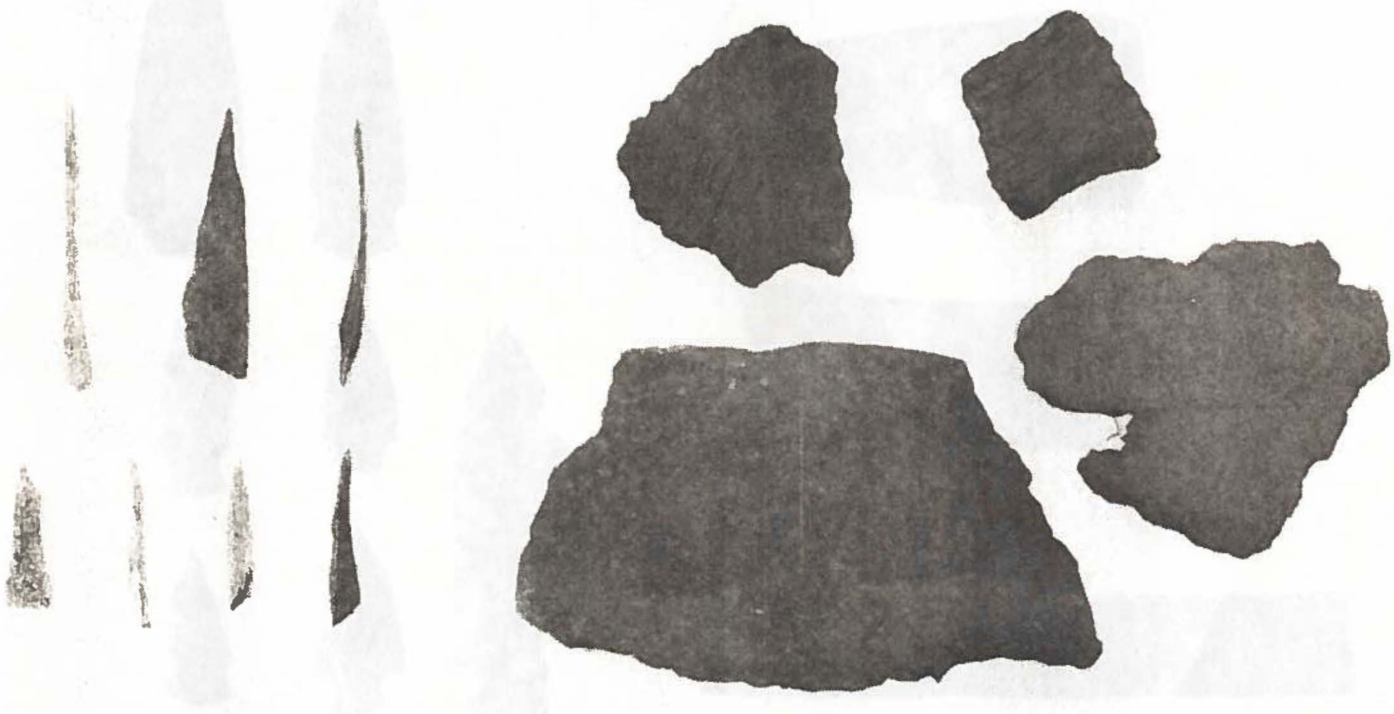


Figure 3B

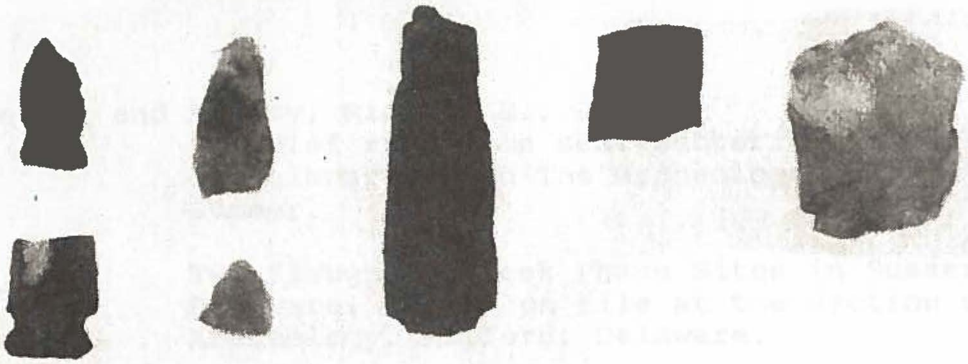


Figure 4A

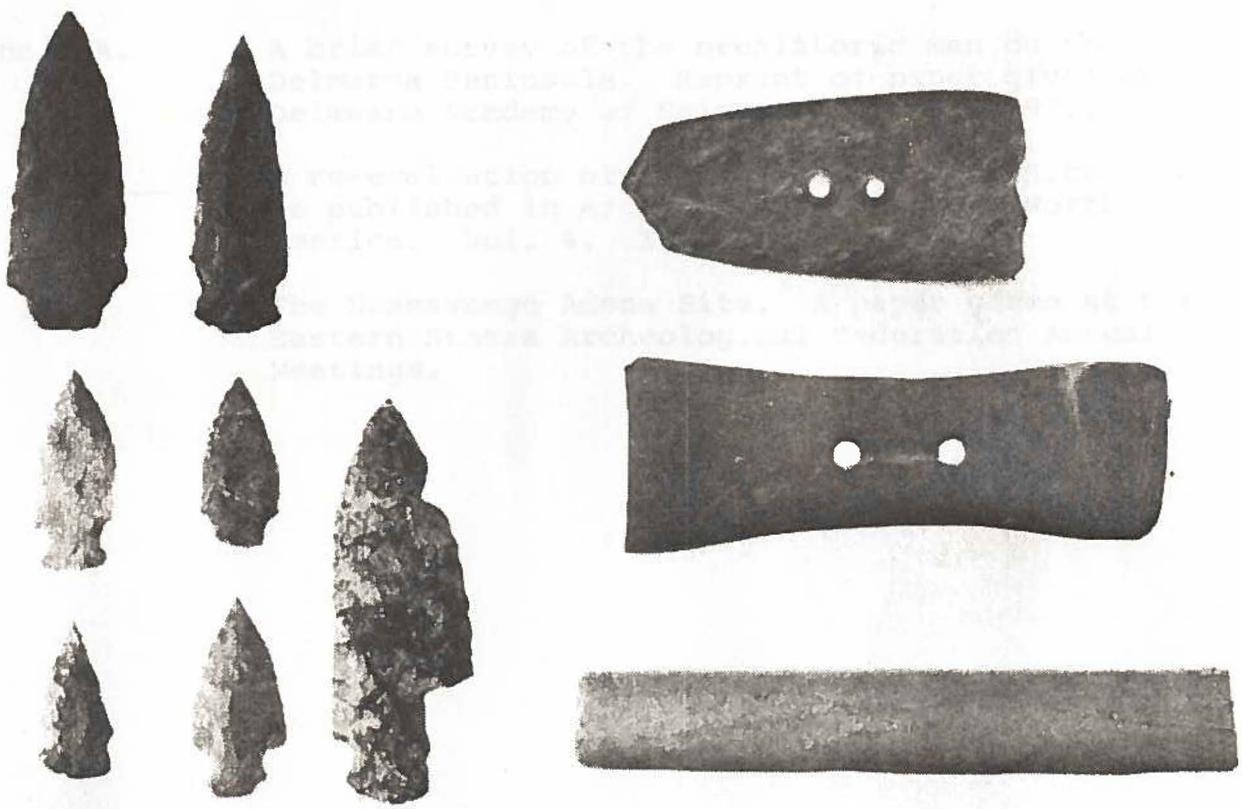


Figure 4B

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