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Contributors

THE MASSACHUSETTS ARCHAEOLOGICAL SOCIETY, Inc.
P. O. Box 700, Middleborough, Massachusetts 02346-0700
THE MASSACHUSETTS ARCHAEOLOGICAL SOCIETY, Inc.
Robbins Museum of Archaeology
Web Site address: www.massarchaeology.org
phone: (508) 947-9005
e-mail: info@massarchaeology.org

Officers:
Suanna Selby Crowley
Victor Mastone
Susan Jacobucci
David Burbine
David DeMello
Curtiss Hoffman
David McKenna
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Suanna Selby Crowley
Philip Graham
David DeMello
Curtiss Hoffman
Kathryn M. Fairbanks
Laurie Stundis

MHC Representative
Newsletter Editor
Archivist
Membership Secretary
Librarian
Administrative Assistant

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Analysis of Two Musket Balls Reported as Being from the March 5, 1770 Boston Massacre

Dan Sivilich and Joel Bohy

Location:
Massachusetts Historical Society, 1154 Boylston Street, Boston, MA 02215-3695
Artifact Number: 0695.01-.02
Composition: Lead with copper wire
Date of Analysis: December 9, 2017

Objective:
To determine if the two musket balls identified as the "Boston Massacre Bullets" currently owned by the Massachusetts Historical Society in Boston are authentic.

Background:
The Boston Massacre is a well-documented event, so a very brief synopsis will be presented of the events leading up to the incident. Due to civil unrest prompted by the Townsend Act of 1767, as many as 4,000 British troops were quartered in Boston. Citizens often had to unwillingly share their residences with soldiers. Tensions ran high amongst the citizens, which led to several clashes with some of the soldiers. On the night of March 5, 1770 it culminated with a band of Bostonians taunting a sentry at the Customs House on King Street. The soldiers called for assistance and were joined by 8 regulars under the command of Captain Thomas Preston. The crowd began throwing snowballs and ice at the soldiers, and eventually the British troops opened fire killing Crispus Attucks, Samuel Gray and James Caldwell nearly instantly and wounding several others including Edward Payne who lived across the street. A sketch, drawn by Paul Revere, currently in the Boston Public Library, identifies the location of Payne at the time of the shooting.

Figure 1: Boston Massacre bullet display (Photo courtesy of Joel Bohy)

Figure 2: Paul Revere's sketch identifies the location of Payne’s house as being the third structure from Quaker Lane

Payne’s house can be seen in an 1801 painting by James B. Marston titled "Old State House". It is currently on display at the Massachusetts Historical Society.
Payne's shutter was struck by one ball, and a second struck Payne in the arm. The musket balls were reportedly retrieved and kept (Figure 1). They were mounted on a black velvet-covered chip board which was mounted in a black wooden picture frame. Two handwritten notes in black ink, by either quill or dip pen, describing what each musket ball hit, were in the center of the display, flanked by the purported musket balls. Brass plates were under each note with a transcription of the notes with the following text:

Left Plate: "This Ball was fired by the British Troops under Capt. Preston in State Street on 5th March, 1770- went thro (sic) the Shutter of Edwd Paynes Office & thro’ a Partition & into the Entry."

Right Plate: "This Ball was fired by the British Troops under Capt. Preston in State Street on 5th March, 1770- and went thro (sic) the Arm of Edwd Paynes Esq. And broke the small Bone of the Arm & then went into the Door Post."

This assembly was placed inside a shadow box. This artifact was donated to the Massachusetts Historical Society in June, 1940 by one W. F. Meredith.

Analysis:
When I became aware of their existence, I was curious to know if they were actually 18th-century British musket balls. Having authored Musket Ball and Small Shot Identification: A Guide, I continue to collect information about musket balls for a possible addendum. I requested and was granted access to examine the artifacts (Portal 1791 Transaction Number 46656). The analysis was conducted on site at the Massachusetts Historical Society. The following persons were in attendance:

- Anne E. Bentley: Curator of Art & Artifacts, representing the museum
- Dan Sivilich: Chemical Engineer/Battlefield Archaeologist and 18th-century military artifact expert
- Joel Bohy: Skinner Auction and military artifact expert
- Bill Rose: Chemist (retired) and 18th-century military artifact expert
- Chris Fox: Skinner Auction, former curator at Fort Ticonderoga and 18th-century military artifact expert
- Tim Riordan: Archaeologist (retired from Historic St Mary’s City, Maryland)

Anne Bentley had removed the picture frame from the shadow box prior to our arrival and noted that it had disintegrated. The first problem encountered was that the musket balls were fastened to the backing with copper wire.
Chris Fox volunteered to attempt to untwist the copper wire using pliers, but indicated that the wire was brittle and could break. Anne allowed him to proceed and one leg of each wire did break off.

The copper wire attached to the lead balls presented a challenge in determining the weights of just the musket balls from which their original diameters could be calculated. The wire appears to be attached by lead solder as seen on the right musket ball, or was possibly melted into the bullet and/or soldered as seen with the left musket ball.

Additionally, Chris Fox noted that the right musket ball appears to have been filed, which would also account for some lead loss. However, some of the loss in weight may have been offset by the addition of the solder used to affix the wire onto the bullet. Chris indicated that, based on his experience using 18th-century files on various metals, these markings appeared to have been made with a crosscut file.

To confirm this hypothesis, an experiment was conducted by the author by filing a reproduction lead musket ball using a machine-made crosscut file. A 0.69” reproduction musket ball was first flattened with a smooth-faced hammer to reproduce the impacted surface. The flat surface was then placed on the file and the ball was gently rubbed by hand in a back and forth motion along the file for several strokes. The results are as follows:
Although the cuts in the lead in the reproduction appear to be deeper, the overall general pattern obtained was nearly identical. This suggests that the 1770 specimen was filed with a finer or more worn file or that fewer filing strokes were used.

The wires appeared to be machine drawn. Their diameters were measured using a digital caliper and both found to be very uniform at 0.0433” (1.10 mm) which is consistent with copper 17 AWG gauge wire. This suggests that the wire was manufactured in the mid-late 19th-century to the 20th-century. Fortuitously, both copper wires snapped and the broken segments could be used to calculate the overall weight of each wire based on the average weight per length of the segments:

<table>
<thead>
<tr>
<th></th>
<th>Broken Wire Length (mm)</th>
<th>Broken Wire Weight (gm)</th>
<th>Weight/Length (gm/mm)</th>
<th>Length of Wire Still in Ball (mm)</th>
<th>Calculated Weight of Wire Still in Ball (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>25</td>
<td>0.30</td>
<td>0.0120</td>
<td>71</td>
<td>0.8449</td>
</tr>
<tr>
<td>Right</td>
<td>22</td>
<td>0.26</td>
<td>0.0118</td>
<td>54</td>
<td>0.6416</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.019</td>
</tr>
</tbody>
</table>

Using this information, the weight of each bullet could be determined. From this data, the original diameter could be estimated using the Sivilich Formula (Sivilich 2016:25-27). With this information, the type of weapon used to fire the bullet could be estimated (Sivilich 2016:28-32).

The standard size for musket balls issued by the British military for a Brown Bess musket with a 0.75 - 0.75” bore is 0.69” in diameter (Scott et al, 2017; Sivilich 2016). However, controlled experimental firings by Scott et al, using British 1756 Long Land pattern reproduction muskets show an average weight loss of 0.68 grams (n = 4 firings) due to slight melting and scraping off lead in the barrel. Additional losses can be expected by impact with hard targets such as wood.

Therefore, the calculated original diameters of the unfired musket balls are consistent with bullets used by the British infantry in Brown Bess muskets during the time period of the massacre.

Both musket balls were significantly deformed indicating that they were fired and hit hard targets at relatively close distances, probably less than 100 yards (Scott et al, 2017; Sivilich 2016). Additionally, close examination of the left musket ball reported to have been fired through a shutter has a small wood fragment embedded in the lead. This is very similar to musket balls fired into green oak and retrieved in the 2017 study (Scott et al, 2017):

Figure 9: 1770 Hit Arm and Door Post (right)
Both musket balls were tested for the presence of blood using Bluestar® Forensic latent blood-stains reagent. Objects contaminated with blood will glow light blue when wetted with an aqueous solution of the active ingredients. Both bullets were dipped into the solution and examined in the darkened room and also checked with a black light. Neither artifact exhibited any luminescence. However, very little work has been done to determine if blood residue can be detected with this method on lead musket balls that are over 200 years old. It is unknown how these two artifacts have been washed, handled, heated during soldering, etc. that could reduce any blood residue. Therefore, this test was inconclusive. However, human blood protein analysis appears to be a more sensitive test. If interested, the Massachusetts Historical Society can contact Paleoresearch Institute in Golden, Colorado for more details.

Conclusions:
Based on all of the measurement data, these artifacts are consistent with 18th-century musket balls issued to British infantry troops for use with their standard issue Brown Bess muskets. Both show deformation from hitting hard targets such as wood and/or bone and the left bullet still has a fragment of wood embedded in the lead. Therefore, it is concluded that these artifacts have a strong probability of being associated with the March 5, 1770 Boston Massacre and the wounding of Edward Payne, as described in the notes associated with them.

References:


The site has been subjected to a substantial amount of archaeological investigation between 1996 and 2017 (Hoffman 1997, 2000, 2001, 2004, 2007, 2011, 2012, 2015, 2016, 2017, 2018). Previous investigations at the Intensive Survey, Site Examination, and Data Recovery levels have demonstrated the presence of components ranging in age from Early Archaic through Late Woodland (radiocarbon means ranging from ca 8000 – 970 B.P., uncalibrated). This work was undertaken under permit from the Massachusetts Historical Commission at the Locational Survey, Site Examination, and (for a small portion of the Third Terrace only) Data Recovery levels of investigation, in response to proposals on the part of the Middleborough Little League to construct yet more ball fields on the Second and Third Terraces. Activities were centered around food-, hide-, and wood-processing, and the assembly and curation (and possible redistribution) of a range of ceremonial products (red hematite, black graphite, and yellow limonite paintstones; quartz crystals; stone rods; and polished pebbles of quartz and other materials) (Hoffman 2007, 2012, 2015, 2016).

Since 2015, excavations at the Little League Site have concentrated on the narrow strip which is all that remains of the Second Terrace. Most of the southern part of this terrace was completely altered in 1985 for construction of a soccer field, and again in 1999 for construction of two baseball fields and a service road. To the north of the 25-meter wide strip of forest, another baseball field was constructed at some time within the past 35 years, prior to any archaeological investigation. Only a small portion of the terrace had been investigated in the original 1996 survey. The total number of 50 cm x 50 cm units excavated at that time was 26. All but three of these units contained pre-Contact artifacts. A total of 145 excavated artifacts and 50 surface artifacts were recovered. Diagnostics included a chert Orient Fishtail (now reclassified as an Alsop Meadows point, Boudreau 2017) within the feature fill of Feature #10, an argillite Small Stemmed or Stark point base in the plow zone, a quartz Small Stemmed point base in the plow zone, a quartz Small Stemmed point from the surface, and a steatite bowl sherd from the plow zone. The range of types for the remainder of the artifacts was similar to that in other operations at the site: cores, preforms, utilized flakes, wedges, scrapers, hammerstones, and knives predominated, with the exception that no ceremonial materials were noted, except for a single steatite sherd. It is entirely possible that these were overlooked by excavators. There was a total of 595 flakes found in excavation and 224 on the surface. In addition, 11 features were identified in the field. A sample of charcoal was extracted from the fill of one of these, Feature 12, for radiocarbon dating, and returned an age of 4890±70 B.P. (Beta-101832, corrected for δC13). The calibrated age is B.C.3735 (3665) 3640. The Alsop Meadows point was found in reddened soil above this charcoal stain.

The 2015-2016 Locational Survey on the Second Terrace utilized a staggered systematic grid pattern with transects at 5 meter intervals and units along them at 10 meter intervals. A total of twenty-eight 50 cm by 50 cm units were excavated (area = 7.0 sq m). The survey recovered materials similar to those found on the First and Third Terraces, as well as a total of 26 features. The assemblage was dominated by ceremonial items, including paintstones (1,190), polished pebbles (1,494), quartz crystals (15), pecked pebbles (9), stone rods (19), and a one-hole pendant. In addition, there were 104 chipped stone tools, 13 ground or pecked stone tools, and 68 rough stone tools recovered from the survey. Only one projectile point, a broken quartz Atlantic base, was recovered. A total of 1,565 pieces of debitage, 695 post-Contact period recoveries, 976 pieces of charcoal, 70 charred nutshell fragments, 3 fragments of mammal bone, and 4,792 pieces of fire-cracked rock were recovered from the survey units. A radiocarbon sample from a hearth feature provided a date of 1940±120 B.P. (GX-124064, δC13 = -25.8) (cal 1899±159; 68% range 1739 – 2058 b.p.).

In the 2017 season, a Site Examination operation was begun on the Second Terrace. Its chief goal was to acquire a more intensive examination of the contents and structure of features to determine site functions in this area. The sampling strategy was to first to choose a random sample of the 50 cm x 50 cm test units from the Locational Survey which contained features. Fourteen feature numbers, out of the total of twenty-four identified in the Locational Survey, were chosen in this fashion for expansion into 1 m x 1 m units. Time permitted eleven of these units to be opened during the 2017 field
season (see Figure 1). Excavation was done with hand tools in 5 cm arbitrary levels within natural soil horizons. This report concerns the excavation of one of these units, N10E29, which was found in the Locational Survey to contain Feature #221.

**Description of Feature #221:**
A 20-25 cm. zone of fill from the construction of the access road lay atop a buried A horizon in unit N10E29. Beneath this was a ca 25 cm plow zone, as in all other units at the site. Beneath this was the feature soil. In the original 2015 unit, the Munsell color of this feature was recorded as 10YR6/4, and its original maximum depth was recorded as 34 cm below junction. Excavation during the 2017 season revealed that the feature was in fact considerably deeper, with a maximum depth of 54 cm below junction. Its Munsell color was recorded as 7.5YR5/6. It appeared to be of relatively uniform depth across the unit (see Figure 2).

The original test unit contained 1 quartz utilized flake, 19 paintstones (16 limonite, 2 graphite, 1 hematite), 44 polished pebbles (26 quartz, 11 felsite, 3 felsite, 2 granite, 1 granodiorite, 1 chert); it also contained 25 flakes (17 quartz, 5 felsite, 2 granite, and 1 arkose). It also contained 5 pieces of charcoal, 1 piece of calcined bone, and 3 pieces of fire-cracked rock. Additional recoveries from the Site Examination included 1 quartz spokeshave, 2 quartz utilized flakes, 1 quartz wedge, 1 argillite anvil, 1 argillite digging tool, 1 basalt pounding stone, 1 granite hammerstone, 11 paintstones (8 hematite, 2 limonite, 1 graphite), 1 quartzite pecked pebble, 170 polished pebbles (50 quartzite, 39 felsite, 38 quartz, 29 chert, 4 basalt, 4 granodiorite, 2 hornfels, 1 chalcedony), 48 flakes (40 quartz, 7 felsite, 1 chert), 50 pieces of charcoal, and 145 pieces of fire-cracked rock.

Near the base of the feature in the northwest corner of the unit – approximately between the vertical and horizontal scales in Figure 2 – was a small circular concentration of charcoal, extending from 40 – 50 cm below junction. Its diameter was approximately 15 cm. The charcoal was collected with a clean trowel and wrapped in aluminum foil. There was no question during fieldwork but that the charcoal was the result of a single depositional event. Since the sample from the B2-09 level (40-45 cm below junction) was slightly smaller than optimal, a second, smaller sample was collected from level B2-10 (45 – 50 cm below junction). The two samples were sent to Geochron Laboratories for radiocarbon dating, with instructions to the lab to combine them. All of this is standard procedure which we have followed at the site for many years. Unfortunately, the lab misplaced these instructions and ran the two samples separately. The results were perplexing: the upper sample provided an age of 3530±160 B.P. (GX-124268), ($\delta^{13}$C = -25.3; cal 3843±211; 68% range 3632 – 4054 bp), while the lower sample provided an age of 6190±290 B.P. (GX-12467) ($\delta^{13}$C = -24.9; cal 7040±311, 68% range cal 6728-7351 bp). (http://www.calpal-online.de/cgi-bin/quickcal.pl)

These two ages obviously do not overlap, even at 5\(\sigma\), yet as noted above there was no indication during fieldwork that the samples were in any way separate, nor that either sample contained different concentrations of potential contaminants such as root hairs. The lab technician, Robert Yriart, claimed that this circumstance was extremely unusual, if not indeed unique for what is ordinarily a very reliable laboratory, and he assured me that their equipment was properly calibrated. Both samples received standard treatment and nothing unusual was noticed about them during processing. While the higher sample was much larger, and provided a more precise standard deviation, the lab was inclined to regard the lower sample as more reliable, because the usual effect of contamination decreases the age of a sample. The lab graciously agreed to bill Bridgewater State University for only one sample.

**Discussion:**
As noted above, Feature #221 did not contain any diagnostic artifacts which could help to reach a conclusion as to which of these two dates is more believable. However, 7 meters away to the northeast, another feature, Feature #216, yielded a flake Merrimack point (see Figure 3), in addition to a quartz utilized flake, an argillite pounding stone, 2 granite pounding stones, a quartz crystal matrix, 29 paintstones (18 graphite, 7 hematite, 4 limonite), 115 polished pebbles (97 quartz, 7 felsite, 6 quartzite, 3 basalt, 1 chalcedony, 1 chert); it also contained 107 quartz flakes, 16 pieces of charcoal, and 17 fire-burnt rocks. Merrimack points are considered to span the latter portion of...
So far for Feature #221, we have submitted combined samples from different levels of features and been satisfied with the dates they have received? If these samples were dated separately, as happened accidentally in this case, might they produce similarly disparate dates? If so, how meaningful are the results from the combined samples? Clearly, the procedure of averaging the two dates from Feature #221 would be inappropriate, and would not yield meaningful results.

This case also brings into question the entire radiocarbon dating process. How many archaeologists have submitted combined samples from different levels of features and been satisfied with the dates they have received? If these samples were dated separately, as happened accidentally in this case, might they produce similarly disparate dates? If so, how meaningful are the results from the combined samples? Clearly, the procedure of averaging the two dates from Feature #221 would be inappropriate, and would not yield meaningful results.

I know of one other site where multiple radiocarbon dates were submitted from the same feature, Feature 3 at the Young Site in Maine (Borstel 1982:64). Here, the 8 radiocarbon means ranged from 3715 to 3105 B.P., with much tighter standard deviations than at the Little League Site, such that the oldest and youngest do not overlap at 5σ, just as in Feature #221. The author of the site report noted that “every date overlaps at least one other at the two sigma level. Even at this level the ends are separated by several hundred years, and the probability is miniscule that the oldest and youngest assays are of the same true age.” He concluded (1982:65) that “in sum, the problem of the range of age in the Feature 3 dates remains unresolved. None of the dates in the suite can be rejected individually on grounds of contamination or insufficient evidence of association, so the entire group must be treated as equally valid or equally invalid.” For the time being, the same conclusion may be applied to the Feature #221 dates at the Little League Site.

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Figure 1: Schematic Diagram of Excavation Units on the Second Terrace
Essex Bay on the Massachusetts coast is rich in artifacts recovered from its islands and peninsulas in the Great Salt Marsh, which stretches along the Gulf of Maine from New Hampshire to Cape Ann. These artifacts, dating mainly from the Middle Archaic through the Late Woodland periods, are stored locally in the Harvard Peabody Museum and the Peabody Essex Museum as well as in many smaller collections, such as the Phillips Collection in the Cape Ann Museum and the Chadwick Collection in the Robbins Museum of Archaeology (Lepionka 2013). Material from the earliest explorations in the 19th century was sent to the collector George Heye for the Museum of the American Indian in New York. This paper describes two significant private collections, the Saville Collection, housed in the Sandy Bay Historical Society in Rockport, and the Ellis Collection, held by the Ellis family in West Gloucester.

The archaeologist Marshall Saville (1867-1935), a Rockport MA native, worked on the mounds in Ohio with F. W. Putnam and excavated in Yucatan, Mexico, Honduras, Ecuador, Guatemala, and Colombia. After 1903 he was Professor of Archaeology at Columbia (Brigham 1935). Saville also wrote about local history, for example, Samuel de Champlain’s visits to Rockport and Gloucester in 1605 and 1606 (Saville 1934). Saville helped found the Sandy Bay Historical Society in Rockport in the
late 1920s to exhibit the stone tools he had collected locally on Cape Ann. These included a cache of net weights and plummets from Lands End opposite rookeries on Thacher Island and Milk Island, plus an assortment of fire-split cobbles, hammerstones, gouges, chisels, pestles, projectile points, scrapers, and preforms from Old Garden, Whale Cove, the Headlands, Pigeon Cove, Lanesville, and Dogtown (Saville 1920) (Figure 1). Of special interest are a gouge painted with red ochre, found on the grounds of the Rockport Country Club (Figure 2), a slate knife with hilt (Figure 3), a holed schist for debarking arrow shafts (Figure 4), several points of exotic stone (Figures 5 and 6), a sinker from a cache of fishing gear (Figure 7), and a pair of double-pointed, three-dimensional, symmetrical unfinished stones he identified as “war clubs” (Figure 8).

The Ellis Collection comprises lithics from Hog (Choate) Island, Cross Island, Spit Island, Conomo Point, and Coles Island in Essex (Figure 9). Some resemble artifacts recovered by Eugene Winter from nearby Essex Falls in the 1970s, stored at the R. S. Peabody Museum in Andover (Winter 2007). Tom Ellis, a Gloucester sea captain, acquired the bulk of his large collection from a groundskeeper on a private estate on Coles Island, a Mr. Roberts, who found them during 25 years of landscaping work on the property. Mr. Ellis bought the collection, more than 200 artifacts, from Roberts’ widow for $100. Provenance and general provenience are established in a 1998 affidavit (Figure 10). Although lacking in ceramics and bone, the Coles Island assemblage closely resembles artifacts from the Neville, Smyth, and Eddy sites in the Lower Merrimack Valley of New Hampshire (Dincauze 1975, Winter 1975, Bunker 2007); the Hunt’s Island, Nelson Island, and Rocks Road Peninsula sites on the New Hampshire coast at Hampton and Seabrook (Robinson 1985, Robinson and Bolian 1987, Greenly 1999); and the Neck’s Creek and Clark’s Pond sites in Ipswich (Bullen and Burtt 1947, Bullen 1949, Greenly 2004).

Of special interest in the Ellis Collection are an atlatl fragment, biface, and adze from Spit Island (Figure 11), a perforated turgite (hydrated limonite) paint stone (Figure 12), a full-grooved ball peen hammer and chisel combination (Figure 13), a woman’s heart-shaped hand tool for weaving (Figure 14), a possible effigy stone in the shape of a bird (Figure 15), net weights (Figure 16), a biface (Figure 17), diverse points (Figures 18 and 19), as well as fossilized calcined shellfish (scallop, soft-shelled clam, knobbed whelk). There are also hammerstones, celts, pestles, chisels, gouges, wedges, abrading tools, scrapers and knives, preforms; and three boxes with dozens of unsorted, unidentified stone artifacts.

While the Ellis Collection mainly exhibits features of the classic Maritime Archaic culture of the Northeast, it also includes a closed mounted and framed assortment of both earlier and later projectile points from the noted Paleoindian site in Ipswich known as Bull Brook (Eldridge and Vacarro 1952, Byers 1954, Grimes et al. 1984, Ort and Robinson 2013) (Figure 22). Tom Ellis bought the display from another unidentified local collector. A handwritten note encased with the exhibit states that the artifacts were collected at Bull Brook in 1953 by Carleton L. Hoyt “in the garden above the sands”. The note is signed by his son Carleton B. Hoyt (Figure 20). Bull Brook artifacts are widely distributed in collections, with the largest being in the basement of the Peabody Essex Museum in Salem, curated by Brian Robinson (1953-2016).

The Ellis Bull Brook points do not include examples of the Clovis or fluted style. However, a large, broad, parallel stemmed point with basal thinning may be Late Paleoindian, and there appears to be an Early Archaic Kirk Stemmed point base (Figure 21). A Hardaway side-notched point resembles Wapanucket ceremonial blades (Robbins 1980, Hoffman 2018) (Figure 23). There is also a Late Archaic Squibnocket style stemmed point of quartz (Figure 24), and a Kirk corner-notched, a Neville Variant, a Stark in quartz, assorted Brewertons and Orient Fishtails in rhyolite, an Atlantic style point of felsite, a Fox Creek, and a variety of triangles. If they are all from the Bull Brook site and vicinity, as claimed, and not simply a collector’s assortment, then the Ellis Bull Brook collection runs the whole gamut of time from Paleoindian to European Contact.

The Saville and Ellis collections unfortunately are not readily accessible for further study at this time, but the world should know of their existence. The artifacts represent surface finds picked up in stream beds or on the beach, plucked out of eroding banks and dunes and middens, and dug up
out of archaeological context as accidental finds in non-scientific excavations. The artifacts themselves and their attested locations nevertheless are facts. Along with recent unpublished CRM studies, these large and unpublished private collections, like the Phillips Collection reported in an earlier paper, point to an important place for Cape Ann in the pre-Contact history of New England.

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Figure 1: Location of Sites Mentioned in This Report
Figure 2: 18 cm Gouge Covered with Red Ochre, Rockport Country Club

Figure 3: 8 cm Slate Knife with Hilt

Figure 4: 16 X 12 cm Holed Schist Artifact

Figure 5: 5 to 8 cm Projectile Points of Exotic Cherts

Figure 6: 4 cm Rossville Points (Quartz and Rhyolite)

Figure 7: 22 cm Granite Sinker, Old Garden Beach
Figure 8: 24 cm “War Club” Head

Figure 9: Islands of Essex Bay
This collection of Native American stone tools, fishing weights and arrow points came to me in 1990 from Mrs. Clifford Roberts of Atlantic Street, Gloucester, MA. She told me that her husband had been a gardener at the Cole estate in West Gloucester for over twenty-five years. He told her that he had found these old rocks on Cole’s Island while moving walls, planting things, etc., and that he thought that they had been left by Indians.

Her husband had been dead for some time and she wanted them to go to someone who might enjoy them more than she did. I paid her $100.00 for the collection. I told her that some day I would give them to a museum, but that I wanted to learn what I could about them first.

Figure 10: Letter Stating Coles Island Provenance

Figure 11: Spit Island Atlatl Fragment, Biface, and Adze

Figure 12: 6 cm Perforated Turgite Paint Stone

Figure 13: 24 cm Full-Grooved Hammer and Chisel

Figure 14: 8 cm Palm Tool for Weaving

Figure 15: 10 cm Possible Effigy Stone
Figure 16: Cross Island Net Weights

Figure 17: Spit Island Biface

Figure 18: Hog Island Point Bases and Spokeshave

Figure 19: Early Archaic and Late Woodland Triangular Points in the Ellis Collection

Figure 20: Ellis Bull Brook Provenance

Figure 21: Bull Brook Early Archaic Kirk Stemmed Point Base
Figure 22: Ellis Bull Brook Display
Michael E. Roberts: The Rocket Scientist of Preservation Efforts in Massachusetts

Barbara Donohue

Everyone’s heard the term “It doesn’t take a rocket scientist...” While the term may apply to many things, it doesn’t appear to apply to preservation efforts, both above and below ground, in Massachusetts. Case in point – Michael E. Roberts.

Michael’s first career choice was far different from his last. Originally a Minute Man Missile engineer, Michael got tired of working towards destroying the environment and decided to work towards preserving the environment. He thus left a lucra-
tive profession for one that provided him both satisfaction and frustration.

While working at Vandenburg Air Force Base in California as an aeronautical engineer building and blowing up missiles, Michael became interested in the shell middens on the base and connected with the San Luis Obispo County Archaeological Society. This fascination with Native American culture acted as a catalyst for his 40+ year career in archaeology.

Michael entered the world of preservation efforts in Massachusetts in the 1970s when he was an engineer for AVCO and taking a graduate course at Harvard in use-wear analysis. At that time Michael took part in an archaeological forum that included both archaeologists and other members of the historic preservation community. Cultural Resource Management (CRM) was a major topic of discussion. Following the forum, Michael became the founder of the Coalition of Archaeology in Massachusetts. He remained the coordinator for the Coalition from 1975 to 1980. Out of this environment Michael started the Institute for Conservation Archaeology (ICA) at the Peabody Museum at Harvard University in 1976 – at the forefront of CRM in Massachusetts.

After Michael left the ICA in 1982, he worked in various other archaeological and historic preservation companies. In the South Pacific he worked in the Development Planning and Reconstruction of a traditional chief’s meeting house in the Republic of Palau, of the Bechial Cultural Center in the State of Yap, of the Nan Madol archaeological site in Ponape State, of the Leluh archaeological site in Kosrac State, and of a historic plantation structure in the Republic of the Marshall Islands. During this period he also did Development Planning for two historic and archaeological sites in the State of Truk, Management Planning for the development of seven historic and archaeological sites in Micronesia, and a Cultural Resource Protection Plan for the Commonwealth of the Northern Mariana Islands.

In 1986, Michael founded Timelines, Inc. Through the years Michael completed over 800 projects. Most of his peers would associate Michael with archaeological projects both large and small (including Data Recoveries of the Central Artery/Third Harbor Tunnel Project, 500 Boylston Street Fishweir, 11 historic sites in Charlestown, and the ship Whydah; Evaluation of the 75 State Street Project; Phase I and II surveys for the Worcester Commuter Rail Extension Project; and Phase I survey for the South Boston Piers Transitway Project). He was also involved in a wide variety of preservation projects, including contextual development for a number of Massachusetts Urban Heritage Parks (Welcome Wayside Project), Cultural Resource Management Plans/Interpretive Programs for a variety of venues (including the Massachusetts Park and Forest System, the Blackstone River Valley Heritage Corridor, City of Fitchburg, City of Haverhill, and Hanscom Air Force Base), and acted as Project Conservator (South Boston Piers Transitway Project).

Throughout this period he assisted the Native American community in New England with information on site protection, AIRFA, NAGPRA and other subjects related to the maintenance of tribal traditions. He worked with representatives of Nipmuc, Wampanoag, Narragansett, Mohegan, Abenaki, and Mi’kmaq Nations regarding historic preservation compliance issues and he prepared Massachusetts’ first study of Traditional Cultural Properties (Mt. Wachusett).

While Michael’s work in CRM would likely be enough to distinguish him, his commitment to preservation efforts always went beyond the eight hour work day. Following his pioneering efforts in the late 1970s, Michael, always the visionary, saw a need for “cross-pollinating” the field of archaeology in Massachusetts with others in New England by bringing prehistoric and historic archaeologists together to discuss a single topic. Working with others who had the same vision he founded the Conference on New England Archaeology in 1980. Branching out from archaeology, he was a founding member of the Board of Directors and Board of Advisors for Historic Massachusetts, Inc. in 1985.

Michael worked diligently towards laying a foundation for the future of preservation efforts in Massachusetts. When given the opportunity, Michael included public awareness/educational outreach components in his projects. In an effort towards having his clients understand the archaeological process he developed a PowerPoint presentation that he presented many times, providing “enlightenment” to those who had a hard time grasping
the world of contract archaeology. Most important of all, Michael acted as a mentor to those who worked for him, giving them a chance to expand their horizons, and was there to provide support and guidance when tasks seemed insurmountable.

Michael’s career path was not always easy. Unable to maintain financial stability in an increasingly difficult environment for preservation efforts, Timelines merged with John Milner Associates, Inc. (JMA) in 2005. Michael continued as a Senior Branch Manager as well as a Preservation Planner for the company’s projects in Massachusetts and elsewhere. During the same year Michael received an award on the 25th anniversary of the Conference on New England Archaeology. The award simply states “The Conference on New England Archaeology acknowledges and honors Michael E. Roberts in recognition of a distinguished career dedicated to Archaeology, Anthropology, and Historic Preservation.” I think that says it all.

In recent years Michael struggled with health issues, yet he worked diligently sharing his expertise in historic preservation with the citizens of Groton, the town where he lived. He was a member of the town’s Historical Commission, Historical Society, Archives Committee, and Community Preservation Committee. His final project involved doing an inventory, followed by repair if necessary, of all of Groton’s historic milestones, monuments, and objects.

If that wasn’t enough Michael also worked with the American Schools of Oriental Research preparing repair, rehabilitation, and management planning for six historic sites in the Republic of Syria, including the World Heritage sites of Palmyra, Bosera, Aleppo, and 80 ancient villages in northern Syria. His final project in the Middle East was developing the initial phases of a comprehensive archaeological analysis at the site of the new Kurdish National Museum in Erbil, Iraq.

While some might categorize Michael’s choices as going backwards – leaving the Space Age to pursue the Stone Age – his mission was always clear and his energy seemed never ending.

I have worked with and been a friend of Michael’s for over 27 years. His vision for preserving the past, both above and below ground, and his continued efforts towards fulfilling that vision were a source of inspiration for me and many in the world of CRM.

A Study of Artifacts from the Collection of Leonard Russell, Danversport, Massachusetts

David McKenna

Abstract:

This article will provide information and copious images of artifacts collected by a farmer in the last century, for further study by those with more knowledge than that possessed by the author, an avocational archaeologist, with no formal training, but an enthusiastic desire to preserve the history of those who preceded us on the earth we all share. The author will offer opinions and his interpretations of the materials presented; and welcomes commentary, as that is how we all learn.

Introduction:

Some time in the early 1990’s, while searching for Danvers collectibles on EBay, that bane of conscientious archaeologists everywhere, the author came across the first listing of what was found to be a very extensive collection of stone artifacts from the collection of a late Danvers farmer.

The author contacted the seller for more information and discovered that he had bought the collection from the family of the late Leonard E. Russell, who had spent his life farming extensive acreage...
on the southern bank of the Crane River, a tidal estuary, in East Danvers, Mass. The antiques dealer agreed to show him the whole collection, which was impressive. In order to keep the collection intact and in Danvers, the author was able to acquire all of the collection with the exception of one celt, which he photographed from the auction listing.

Description of the Collection:

The collection consisted of three 12” x 16” Riker display cases of 147 points and six blades, five axe heads, six celts of various types, a plummet, a fishing net weight, nine impressive stone gouges, grinding tools and other stone items that will be described in more detail later in this article.

From historical data that the author was able to glean, mostly from the South Essex County Registry of Deeds, it appears that Mr. Russell was plowing land on the south bank of the Crane River (see Figure 1). Unfortunately, most of the site was totally destroyed by commercial development in the mid 1970s and is 95% paved. However, portions of the site closest to the river are still intact, though most of it was likely intensively plowed over the years. A portion of that area is currently listed as a Superfund Site, due to leachate from a beam house for processing leather, and from the dumping of tannery wastes.

Figure 1 shows the estimated locus of Russell’s farming, outlined with a black line, as viewed aerially (GoogleEarth.com). As the reader can see, virtually all of the land (as shown in the 1971 Plot Plan on the right (South Essex Registry of Deeds Bk. 120/p.15), was paved over. The remainder may hold some potential for excavation. The third image in the Figure shows the areas of active agricultural usage in 1944 from an aerial survey by the Town of Danvers (Danvers Archives 1944 Aerial Survey plate 69).

In the middle of the undeveloped portion of the land lies the historic Endicott Family Burial Ground, currently maintained by the Danvers Historical Society. It is the final resting place of many of the early relatives of Governor John Endicott, who coincidentally planted the Endicott Pear Tree in 1632, the oldest documented domestic fruit tree in North America, just a few hundred yards away across Endicott Street. After nearly 400 years of assaults by New England winters, hurricanes and vandals, it still bears bushels of fruit each year. Immediately west of the Endicott burial Ground is the Russell Family burial plot, where Benjamin, Leonard, and a dozen members of their family rest.

There is also an oral tradition that just outside the east wall of the Endicott Cemetery, several slaves and Native Americans were interred in the 17th and 18th centuries. When a developer appeared before the Planning Board, seeking a Subdivision Approval and Special Permit to build Condos in the 1980’s, the applicant and his engineers refused to acknowledge the information without proof, and sought permission to build right up to the wall of the cemetery. The author, using divining rods, a technology he uses regularly in his cemetery management profession (Robbins, 1973:220-222), got at least a dozen “hits” in the area, and so informed the Planning Board of his subterranean evidence. The Board granted the approvals, with the condition that any excavation within 100 feet of the wall of the cemetery would be supervised by the Board of Health to watch for potential grave shafts. However, the development never occurred due to the discovery of the aforementioned toxic tannery wastes.

Local lore says that Leonard Russell (1898-1986), and likely his father Benjamin (1851-1923) before him, plowed his farmland with a horse-drawn plow. He was thus in a good position, walking in its wake, to see and retrieve such artifacts that the iron plowshare brought to light. Even if he were using a tractor to turn the soil in later years, farmer/collectors have told the author that exhumed projectile points would have been visible from the tractor seat as the soil was turned over.

We shall perhaps never know whether Benjamin, and perhaps his father, also collected the bits and pieces of history that the earth gave up, but it is safe to say that Leonard did, and his sharp eye left us with a treasure trove of stone tools from an earlier age to study.
The Artifacts

Figures 2, 3 and 4 are three 12x16 inch Riker trays of points, knife blades, and other knapped tools. The typology runs the gamut from Brewertons, Beekman Triangles, lanceolates, Atlantics, corner-notched, Starks, Nevilles and Madisons, and one broken drill. Two even display the characteristics of Daltons. While there are two that bear the outline of a Clovis, there is absolutely no fluting present. (Boudreaux 2016, 8-158)

Materials are what one would expect to find in an eastern Massachusetts site: argillites, rhyolites, milky quartz, Marblehead felsite, Blue Hills felsite; and two of the larger blades in Figure 2 are of Onondaga chert. (Boudreaux 2016:159-170)

The typology leads the author to hypothesize that the site was occupied from the Middle or Late Archaic (possibly even to the Early Archaic if the Daltonesque points bear up to more expert scrutiny), to just before Contact. The author will leave final typological identification and interpretation to those more learned in the subject matter than he professes to be.

The hand held grinder in Figure 5 is of a style that the author has never before encountered. Whether it is a glacial erratic that some early inhabitant discovered and modified for his or her use, or whether it was manufactured to that shape, the bottom is perfectly flat across the bottom grinding surface, and is highly polished.
Figure 6 shows a flat bifacial grinding tool and a round tool, highly polished, that could be either a grinder or a nutting tool.

Figure 7 shows a well-used hoe, made of local schist. It shows considerable use-wear and damage to the working surface. (Willoughby 1935:171)

Figure 8 shows a large plummet and another grooved weight, giving evidence that the people
occupying the site engaged in fishing in the tidal currents either in the estuary, or further out into what is now known as Salem Sound. (Willoughby 1935:175)

Figure 8: Plummet and Net Sinker

Figure 9 shows a hefty granite gouge with ridges for lashing it to a handle. (Willoughby 1935:34)

Figure 9: Granite Gouge

Figure 10 shows a large heavy granite axe damaged at the cutting edge and a pair of hardstone gouges, pecked and polished to a fine texture, with a still quite sharp cutting edge. The late learned avocational archaeologist Eugene Winter, upon viewing these two gouges, opined that they were at least middle Archaic, and possibly early Archaic in age. (see also Boudreau 2016:145)

Figure 10: Gouges and Axe

Figure 11 shows four gouges, possibly of basalt. The crude gouge on the right is shown in greater detail in Figure 12. (Willoughby 1935: 31-40)

Figure 11: Gouges

Figure 12: Coarse Stone Gouge
Figure 13 contains four more axe heads recovered from the site and a small, very weathered or water-worn stone gouge. (Willoughby 1935:33, 138-140)

Figure 14 shows three celts: the bottom one (possibly a maul) very thick and stubby with a very obtuse angle and made of granite; the middle one, likely broken, possibly is made of greenstone or hornfels. The top one is elliptical in cross section, possibly of basalt, with the cutting edge toward the left. (Willoughby 1935:142)

Figure 15 shows a pair of preforms. The top is of an unidentified brown rhyolite-like material; the bottom is a blank made of what Dr. Nathan Hamilton, of the University of Southern Maine, identified as Vinal Haven banded chert from Vinal Haven Island in Penobscot Bay, half way up the coast of Maine. Was this traded material, or the result of a trek of 182 miles overland to mine raw materials (probably 175 miles by boat)? Could it possibly be the result of cobbles being pushed south by the ice sheets of the Laurentide glaciations? This seems unlikely, due to the relative longitude: Penobscot Bay is at least 50 miles east of the Danvers site, unless these cobbles were retrieved from the exposed coastal plain before it was inundated by rising sea levels as a result of meltwater from the retreating glaciers. Interestingly enough, there is another very similar preform of the same material in the collections of the R. S. Peabody Museum in Andover Massachusetts with nearby provenance (Boudreau 2016:167).
Figure 16 shows a group of polished stone items that came with the collection. The ovoid objects on the right are highly polished material that looks to the author to be limestone, but in any case resembles no local material the author has observed in use by local indigenous peoples. The one on the lower right appears to have marks or stains in a fairly regular pattern around the circumference, but only on the side shown.

The three spherical stones could be hammerstones or gaming stones: the two upper ones show pecking marks, whether from being shaped, or from having been used to shape other tools; the one at the center is too soft a material to be useful as a hammerstone.

The two items on the lower left are a puzzle: are they simply cobbles polished by wave action on a beach; cobbles collected for knapping into tools later; or simply random pieces of rock?

Item 1 is round in cross section; roughly 25 cm long, by 2-2.5 cm. Item 4 is roughly 12 cm by 1.75 cm with a rectangular cross section, both appearing to be of black basalt; being of undetermined usage. Items 2, 3, 6 and 8 are highly polished tools; 2, 3 and 6 appearing to be of limestone, similar to the objects in Figure 16. Item 2 has a flat side as if it were being used to polish something; Item 8, of a black material, is bent like a handle for polishing; while Items 3 and 6 have sharpened edges like a honed knife blade, with a protruding handle. Were they knives? Perhaps they were used as splitting froes for delicate woodworking? Readers are welcome to share their ideas on the potential use or origin of these items with the author, at davemckenna50@comcast.net. Items 5 and 7 are two small celts, both appear to be ground and polished black slate, and likely are from Russell’s site. Item 9 is a piece of a bannerstone made of banded slate, and while it could be from this site, it is the only piece in the entire group to have mounting glue on the back of it, so the author has his doubts as to its provenance or authenticity.

Figure 17 is where the interpretation gets really difficult. The antiques dealer from whom the author purchased the collection was adamant that these items came with the rest of the artifacts. As there was no reason for him to misrepresent them (he could have kept them and sold them separately from the group of provenanced artifacts for which he had already been paid, one would have to assume he was being truthful.) That being said, there is no way to know if Leonard Russell actually found them on his land, or they came into his possession via some other means. We will never know their origin, but they are included in this review. This example further demonstrates the premise that it is difficult and sometimes dangerous to try to analyze unprovenanced collections.
Figure 18 is of an 8 by 2.75 inch ground celt that sold at auction on Ebay for a far higher price than the author ever expected.

![Figure 18: 8 in. x 2.75 in. Celt](image)

Figure 18 shows ten more various points, including a gorgeous needle-tipped Orient Fishtail (3rd row center), which the author has given to the Town of Danvers Archivist.

![Figure 19: Additional Projectile Points](image)

Figure 19 shows ten more various points, including a gorgeous needle-tipped Orient Fishtail (3rd row center), which the author has given to the Town of Danvers Archivist.

The evidence of so many woodworking tools also supports a hypothesis that there was dugout canoe manufacturing occurring at the site, providing the people with transportation for fishing and trade, both on the river system, and along the coastal routes.

The evidence of the plummet and the grooved net weight lead one to the assumption that fishing played an important role in their activities there, as well as agriculture, based on the recovery of the hoe blade.

While it is unfortunate that so much of the site has been destroyed by development in the 1970's, a significant portion of the site closest to the riverbank still remains intact, although part of it is a Superfund site, and much of it has likely been extensively plowed for agriculture in modern times. If further development is planned in the future, the site should be surveyed and properly studied.

Conclusions:

The artifacts collected by Leonard Russell, and perhaps by others of his family, lead the author to the conclusion that this site saw extensive occupation from as early as the Early Archaic, up to just prior to Contact. The people occupying the site at the time of European contact would likely have been the Naumkeag, as the Crane River system was believed to be the approximate boundary between their territory and that of the Agawam people to the north, as shown in Figure 20.

![Figure 20: Tribal Land Map (South Essex County Registry of Deeds: Perley Map of Indian Lands)](image)

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Winter, Eugene
CONTRIBUTORS

Joel Bohy is Director of Historic Arms & Militaria for Skinner Auctioneers and Appraisers in Boston. He is an expert in antique weapons and is regularly seen on Antiques Roadshow. He is a staff member of Advanced Metal Detecting for Archaeologists (AMDA) and has worked on excavation of a number of battlefields. Joel has published articles about the American Revolutionary War, including “The Arms of Lexington and Concord” in *The American Rifleman* with co-author Don Troiani. He is currently writing a book documenting extant objects related to the events of April 19, 1775 and the Battle of Bunker Hill.

Barbara Donohue is a historic archaeologist who received her MA in New England Historic Archaeology at UMASS Boston. In 1991 she began working at Timelines with Michael Roberts on the Central Artery Project (aka The Big Dig) processing artifacts, conducting primary research, and co-authoring several technical reports. Since 2006 she has been working as a consultant. Most recently she has been working on Preservation Management Plans for both family and town burying grounds.

Curtiss Hoffman is the Editor of the *Bulletin of the Massachusetts Archaeological Society*, and has been a Society member since 1973. He has previously served as President of the Society, as well as President of the Northeastern Anthropological Society. He is the author of numerous articles and monographs on local archaeology and cognitive anthropology. He has recently retired from a 40-year teaching career in Anthropology at Bridgewater State University.

Mary Ellen Lepionka of Gloucester is an independent researcher studying the pre-Contact and Contact periods on Cape Ann in preparation for a book on the subject. She is a retired publisher, author (*Writing and Developing Your College Textbook, Writing and Developing College Textbook Supplements*), editor, textbook developer (Pearson Education, Houghton Mifflin), and college instructor with an MA in anthropology from Boston University and ABD studies at the University of British Columbia. Prior to her career in college textbook publishing, Mary Ellen participated in salvage archaeology on Great Neck in Ipswich, taught anthropology at Boston University and other institutions of higher learning, participated in the excavation of an Iron Age Bantu refuge settlement in Botswana, and conducted fieldwork in Riyadh, Saudi Arabia. Her articles have appeared in the Fall 2013, Spring 2015, Spring 2016, and Fall 2017 issues of the *Bulletin of Massachusetts Archaeological Society*. She is a member of the MAS Board of Trustees.

Dave McKenna is an avocational archaeologist, a 10-year member of both MAS, where he serves as Corresponding Secretary, and the Eugene Winter Northeast Chapter, where he serves as Treasurer. He is the third generation owner of an 89 year old cemetery management service, caring for 21 cemeteries over a 53 year period. He served 12 years as a Danvers Selectman, 15 years on the Town’s Fincom, and currently serves as Vice President of the Danvers Historical Society. He shoots flintlocks, and can finally hit the broad side of a Woolly Mammoth with an atlatl dart at 30 meters. He started his journey in archaeology 53 years ago, surface collecting in a plowed field in Danvers, and is now excavating an Archaic site on that same field owned by one of the cemeteries he manages.

Dan Sivilich is a battlefield archaeologist with more than 30 years in the field. He has conducted numerous battlefield excavations both in the US and abroad. He is well known for the Sivilich Formula, which is used worldwide to calculate the original diameters of non-spherical musket balls based on their weight. He is the author of the book *Musket Ball and Small Shot Identification: A Guide*. He has written numerous articles on Revolutionary War-era historical archaeology.
NOTES TO CONTRIBUTORS

The Editor solicits for publication original contributions related to the archaeology of Massachusetts. Authors of articles submitted to the *Bulletin of the Massachusetts Archaeological Society* are requested to follow the style guide for *American Antiquity* (48:429-442 [1983]). Manuscripts should be sent to the Editor for evaluation and comment at c1hoffman@bridgew.edu.

For shorter manuscripts (5 pages or less), texts may be submitted as paper copies. Longer manuscripts should be submitted as electronic files (preferably MicroSoft Word .doc or .docx files, or .rtf files). All text should have margins of 3 centimeters (1¼ inch) on all edges. For electronic files, do not insert artificial spaces between lines; instead, use the Format/Paragraph/Line Spacing function and select “Double”. Proper heading and bibliographic material must be included.

Bibliographic references should be listed alphabetically by author’s last name and presented as follows:


Several references by the same author should be listed chronologically by year. Reference citations in the text should include the author’s name, date of publication, and the page or figure number, all enclosed in parentheses, as follows: (Bowman and Zeoli 1973:27) or (Ritchie 1965: Fig. 12). All information derived from published sources must be cited, whether it is directly quoted or paraphrased. Please check to make sure that all citations in the text match bibliographical entries, especially dates of publication.

All illustrations and tables, called figures, should be submitted as separate electronic originals. If a large number of figures is involved, authors may use DropBox to send them to the Editor. Tables should be submitted as separate Excel (.xls or .xlsx) spreadsheets and not incorporated into the text. Figures should be submitted as either .tif or .jpg files, high contrast (300 dpi minimum), in greyscale. Each figure should fit within the space available on a *Bulletin* page, which is 17 cm by 23 cm (6½ x 9 inches), allowing for margins. Full, half or quarter page figures should be planned carefully. Width dimensions for one-column images are 3.35 inches (8.5 cm). Space must be allowed for captions. Captions should be in title case and should accompany the text in a separate section, in order and numbered to correspond to the figures.

Figures must be referred to in the text and are to be numbered in their order of reference, with their number indicated in the file name. Every item in each figure and each person should be identified. All lettering must be clear and legible. Scales with dimensions, preferably in metric measurements, should be included with all figures for which they are appropriate.

Dimensions and distances should be given in metric units or in metric units and English units, to the same standard of accuracy (e.g., 10 cm or 2.5 inches, not 2.54 inches).

Authors should include a brief (1 paragraph) biography for the “Contributors” page of the *Bulletin* issue.