A Brief Historical Retrospective of Investigations of Archaic to Contact Period Copper-based Metal Artifacts in Northeastern North America

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The use of native or pure copper and European-introduced copper-based metals in the production of ornamental and utilitarian forms by First Nations groups has long been recognized in Ontario and the broader northeastern North America region. This paper presents a brief review of some of the projects that have examined these artifacts and the use of metal materials beginning with Sir Daniel Wilson's investigations in the late 1800s of native copper used by Archaic groups and ending with recent research into the use of European-introduced copper-based metals by First Nations groups during the early and middle contact periods undertaken at the University of Toronto. In particular, this paper highlights Martha A. Latta's role in these latter studies, many of which have been completed by graduate students under her supervision.

Introduction

The use of copper-based metals by First Nations groups has long been recognized in Ontario and the broader northeastern North America region. This paper is a review of some of the projects that have examined these artifacts and the use of metals in this region and, while extensive, is not meant to be exhaustive. The primary focus is to highlight the role of scholars, especially Martha A. Latta, based at the University of Toronto, in these investigations. Though investigation of the meaning of these materials is important and has been addressed by several researchers, this paper focuses primarily on the projects that examined the forms created from copper-based metals, the technological aspects of the copper-based artifacts including the techniques used to manipulate the metal, and the use of advanced analytical techniques to determine the chemistry of the metal artifacts.

Examinations of Native Copper

Early to Modern Investigations

During the mid-nineteenth century, increasing numbers of metallic artifacts, especially those crafted from native copper, were recovered throughout the Northeast. The earliest discoveries of native copper artifacts recovered in context occurred through Ephraim Squier and Edwin Davis's investigations of the Moundbuilder sites located throughout the central Ohio region (Squier and Davis 1848). Their field work coincided with the earliest systematic descriptions by a variety of antiquarians and early scholars of precontact copper mining and working from areas near Lake Superior, a rich source of native copper in this part of the continent (Martin 1999:49).

Sir Daniel Wilson and his colleagues at the University of Toronto were the first "Canadian" researchers to scientifically investigate copper artifacts of this type. Their work focused on forms recovered from Ontario sites beginning in the early 1850s (Wilson 1876). At this time Wilson and his colleagues were primarily concerned with the origin of the material, whether all of the material was native copper procured from the rich copper-mining area near Lake Superior, or whether this material was smelted metal introduced from elsewhere (Wilson 1876:215). They submitted samples of the artifacts for chemical testing to determine the specific gravity of the samples and dissolution of the samples by immersion into nitric acid and subsequent identification of the residual liquid for other metals and trace elements. This work, undertaken at the University of Toronto under

the direction of Professor Henry Croft, led them to conclude that the sampled artifacts were fashioned from native or pure copper. Wilson also investigated the manufacturing techniques used for both mining the copper and for fashioning artifacts from the metal (Martin 1999:54; Wilson 1876:228, 237). Importantly, Wilson's use of the comparative method led him to evaluate the evidence recovered in the Lake Superior region against other areas of mining activity, in particular the mining districts of Wales. This led to his observation that the basic technique used to work the material in North America – hammering – was used by metalworkers in other parts of the world, suggesting that people confronting similar materials solved manufacturing problems in similar ways (Martin 1999:54; Wilson 1876:228, 237). Through their investigations, Wilson and his colleagues formally introduced the Lake Superior region as a probable source area of the native copper used by First Nations people throughout the Northeast, a model which has long been used without challenge (see Martin 1999; also Levine 1996, 1999 for arguments against this model).

Many others have followed these early investigations with their own examination and descriptions of the native copper artifacts characteristic of the Old Copper Complex (and contemporary Late Archaic/Early Woodland period cultures), the Adena (and concurrent Early/Middle Woodland period cultures), the Hopewell (and related Middle to Late Woodland cultures) and later Mississippian cultures (such as those artifacts recovered at the Etowah, Spiro and Moundville sites among other locations) (see for example Blitz 1986; Brown 1989; Cree 1992; Esarey 1986; Fogel 1963; Fundaburk and Foreman 1957; Goad and Noakes 1980; Goodman 1984; Greber and Ruhl 1989; Halsey 1996; Heckenberger et al. 1990; Jury 1965; Kenyon 1986; Larson 1959, 1989; Martin 1999; Popham and Emerson 1954; Ritzenthaler and Quimby 1962; Steinbring 1970, 1990, among others). The approaches of these researchers vary extensively from simple description and counts of recovered artifacts (see for example Jury 1965) to use of advanced analytical techniques to address questions of source material and /or trade (see Goad and Noakes 1980).

Early Experimental Work on Native Copper

The earliest experimental work on the manufacturing techniques used to construct native copper artifacts was by Frank Hamilton Cushing of the Bureau of American Ethnology in the 1890s (Cushing 1894; Martin 1999:113-114). His work focused on copper objects recovered from groups in the contemporary Southwest (in particular the Zuñi) and from earlier Adena and Hopewell sites. He experimented with different manufacturing techniques in an effort to determine the process of manufacture used for their creation and was the first to suggest that the techniques employed on metallic raw materials were based on those used in the creation of other objects crafted from different raw materials such as stone or shell (Cushing 1894:97). Cushing argued that almost all native communities used heating techniques to produce hide or horn objects and to straighten arrow-shafts and that this surely led to the application of heat on copper, which led to annealing of the material (Cushing 1894:98). Annealing of the copper enables the reversal of work-hardening effects of initial hammering of the object. After the application of heat, the copper returns to a more malleable state. Cushing argued especially that the technological activities of hide-working and hammering copper into sheet have marked similarities, including the placement of material on stone anvils and the use of stone mauls to 'spread' the hide and copper through a particular hammering pattern (Cushing 1894:100). Cushing experimented with these techniques himself and found it relatively easy to groove plates with bone or antler embossing tools and to remove the resulting figural designs by grinding the raised lines present on the reverse surface of the piece (Cushing 1894:101-104). This process would leave raised edges on the removed pieces that could then be flattened after removal.

Charles C. Willoughby's early work echoed Cushing's work on metal objects from Moundbuilder sites (see Martin 1999:116-119 for a general discussion; Greber and Ruhl 1989 for specifics). Willoughby (1903:55) experimented with native copper from Lake Superior mining sites and used traditional techniques of cold-working

and annealing in a successful attempt to duplicate recovered Hopewell ear spool forms. He followed a simple manufacturing sequence, hammering a nugget of native copper into sheet with water-worn stones and performing a low-temperature anneal of the pieces using a camp-fire. He finished the sheet he created by grinding it to a uniform thickness between two flat stones, using fine sand between them as an abrasive. He cut the sheet into circular forms by using sharp flints to outline the shape, breaking off the excess material, and grinding the rough edges. He then cladded the experimental piece (i.e., worked the copper sheet over a wooden form) he was trying to recreate and burnished the copper around the form using an expedient pressing tool manufactured from discarded bone. To finish the piece, he perforated it using a flint 'drill' and polished the piece using a final grinding of fine sand followed by shining with wood ashes (Willoughby 1903:55).

Additionally, a number of experimental studies undertaken in the early 1980s, on native copper, showed that it would have been quite possible, if time-consuming, for native craftsmen to manufacture objects like tubular beads themselves (see Franklin et al. 1981; Franklin 1982). Ursula Franklin, a metallurgist formerly at the University of Toronto, experimented with native copper in order to replicate copper objects recovered from Thule, Copper Eskimo, Athabascan and Chipewyan contexts in the Canadian Arctic. She succeeded in duplicating the microstructures observed in the original pieces by following a working-annealing-working-folding sequence and also by hot working small fragments of native copper (Franklin 1982:50).

Another experimental study, undertaken by Jonathan Leader (then at the University of Florida), showed that metal artifacts were often based on artifact forms crafted from other materials such as shell or wood and that the manufacturing techniques employed were those initially used on these other materials, an idea first put forward by Cushing following his observations of Zuñi metalworkers (Cushing 1894; Leader 1988, 1991). This research focused on the retention of basic techniques over time and the adoption of new techniques by examining metalworking techniques used by different cultural groups in the Northeast from the Late Archaic (Old Copper Culture), to Middle Woodland (Adena/Hopewell) and Mississippian (Etowah and Southeastern Ceremonial complex) periods (Leader 1988).

Approaches to Analysis: Native Copper

Sophisticated analytical techniques, such as metallography, were also employed in the examination of recovered metal material during the very earliest phases of investigation of native copper artifacts. Curtis Wilson and Melville Sayre used this technique in 1935 to compare native copper from the Lake Superior region with copper recovered from Ohio mound sites and sites in Wisconsin (Wilson and Sayre 1935). Metallographic study necessitates removal of a section of the study piece, then polishing and etching it to reveal its granular structure (Martin 1999:115; Vernon 1990:500; Wilson and Sayre 1935:109). Those structures form specific patterns that reflect the treatment of the metal, whether it was annealed or cold worked, for example.

Metallography, as well as advanced analytical techniques such as neutron activation analysis (NAA) and x-ray fluorescence spectroscopy (XRF), has also been applied to artifacts originally described by Squier and Davis from Moundbuilder sites in the Ohio River Valley and from Copper Inuit sites under the direction of Michael Wayman and his colleagues at the Slowpoke Reactor Facility at the University of Alberta (Wayman et al. 1992; Wayman et al. 1985, respectively).

Examination of European-introduced Copper-based Metals

Descriptions and the Construction of Typologies

Early analytical work on artifacts made from European-introduced copper-based metals[1] frequently took the form of description and visual analysis. This is particularly true of William Beauchamp's (1903a, 1903b) work for the New York State Museum, which is a record of his personal observations of metal implements and ornaments recovered from precontact and postcontact sites in New York within the framework of broadly functional typologies that separated

ornamental forms (such as beads, pendants and bracelets) from utilitarian forms (such as projectile points and knives). Beauchamp discussed the general importance of metal in native culture and included detailed drawings of the studied objects. Interesting is his description of several examples of copper and copper-alloy beaded "belts" on which roughly standard-size tubular beads were apparently sewn in uniform rows, reminiscent of later wampum belt configurations (Beauchamp 1903b:Plate 25).

In Ontario, David Boyle's Annual Archaeological Reports were the primary venue for reporting early finds of European-introduced copper-based metal artifacts (Boyle 1889, 1891, 1892, 1896). This primarily took the form of detailed descriptions of copper-based metal artifacts as they were recovered through intentional excavation or through farming and construction activities throughout the region during the late 1880s and 1890s.

The independent work of Beauchamp and Boyle foreshadowed W. J. Wintemberg's analysis of objects recovered on Iroquoian sites in Ontario in the 1920s (1926) and Charles C. Willoughby's examinations of objects recovered from New England sites (Willoughby 1973), research which was undertaken in the 1930s. Like Beauchamp, Willoughby also described lengths of copper and copper-alloy tubular beads recovered from sites of the early (ca. AD 1480/1500-1614) and middle (ca. AD 1614-1690) contact periods (Willoughby 1973:237).

The first researcher to tie the use of native copper and other metals to historical records was T.A. Rickard (1934). His analysis highlighted the differences between native copper and European-introduced copper-based metals. Similarly, many scholars have published descriptive essays of archaeological sites that include detailed descriptions of the artifacts recovered. Examples include reports on grave sites in Rhode Island, Massachusetts, Nova Scotia, Long Island, Ontario (Brenner 1988; Chapin 1926, 1927; Dincauze 1974; Dunbar and Ruhl 1974; Fowler 1973; Hadlock 1948; Harper 1957; Jeppson 1964; Latham 1957; Noble 1971; Robbins 1959, 1968; Sherman 1960) and from other sites associated with contact-period trading activities (Boisvert et al. 1994; Cox 1996). Site artifact catalogues have also been produced for six of the early contact Seneca sites (Sempowski and Saunders 2001; Wray et al. 1987; Wray et al. 1991).

William Fowler, working in the early 1970s, suggested from a visual examination of "certain excavated evidence" that the Dutch imported tubular copper-based metal beads of uniform length specifically for the fur trade (Fowler 1973:30). Unfortunately, he revealed no details of this evidence nor do Dutch historical records of this period appear to support his claim.

Reworking of European-introduced Copper-based Metals as an Industry

In the mid-1970s researchers shifted towards an acknowledgment of native choice and active adoption of certain European trade goods during the early and middle contact periods in the Northeast. Martha A. Latta, working with Wendat collections in Ontario, was the first researcher to recognize that European trade kettles might have been important as a raw material source rather than for use in their European forms while James Bradley, working with Onondaga collections in New York, was the first to focus upon the use of copper and copper-alloy materials as an industry equivalent to lithic or ceramic production (Bradley 1979, 1987a, b; Latta 1976: 229).

Approaches to Analysis: European-introduced Copper-based Metals

Similar to its use in examining native copper artifacts, metallography has been applied in investigations of European-introduced copper-based metals. Metallographic analysis makes it possible to determine if the metal has been smelted, allowing the sorting of native and smelted coppers and alloys. This technique has been used by Helene Dunbar and Katherine Ruhl (1974) for this purpose in their examination of seven copper artifacts recovered from the Susquehannock Engelbert site in New York. They determined that two of the artifacts had been formed from native copper, while the rest had been fashioned through the re-use of European-introduced smelted copper-based metal.

James Bradley and S. Terry Childs noted that metallographic analysis provides a means for reconstructing the processes of manufacture after casting but recognized that, for postcontact artifacts recovered in the Northeast, metallographic analysis may also identify the last stages in European processing of the original kettles or sheets rather than solely the Native metalworker's use of annealing and cold working (Bradley and Childs 1987:55). They employed metallographic analysis to ascertain the manufacturing techniques used to create specific types of copper-based metal artifacts commonly known as spirals and hoops found on several early Seneca, Onondaga and Susquehannock sites (Bradley and Childs 1991). Their research highlighted the likelihood that these spiral and hoop types were manufactured by native artisans, based on three reasons (Bradley and Childs 1991:15). First, different metals were used for the same forms on the same site, which would probably not be the case if they were European-manufactured pieces. Second, the techniques used to manufacture these pieces were well within the documented abilities of precontact Native metalworkers and there is no evidence for advanced techniques, such as soldering or joining, that were practiced in Europe during this time period. Third, the manufacture of these pieces varied but the pieces themselves showed similarity in shape and style, suggesting that there was no one set of steps followed to make these artifacts—i.e., no rigid *chaîne opératoire*—but rather individual or localized preferences (see Anselmi 2004 for further discussion).

Advanced Techniques: Identifying Chemical Composition

Advanced analytical techniques such as optical emission spectrography (OES), electron microprobe (EMP), atomic absorption spectroscopy (AAS), proton-induced emission spectroscopy (PIXE), and especially neutron activation analysis (NAA), have been principally used to sort materials according to base metal, whether native copper, smelted copper or copper-alloy. This is of particular importance as the presence of smelted, European-introduced metal is a diagnostic feature of early contact period sites.

Optical emission spectrography (OES) involves the recording of emitted wavelengths of light following the excitation of electrons, usually from an electrical source (flame, spark or arc; Leute 1987:141). Emitted wavelengths are specific to elemental composition of the sample tested and the more intense an emitted wavelength, the greater the amount of that element in the sample. Researchers at Revere Copper and Brass (New Bedford, Massachusetts) first used this technique to determine the chemistry of a copper bead discovered in a grave in Holyoke, Massachusetts, in the 1940s (General Research Department 1942). Bradley and Childs (1987) used this method as well, though in combination with metallographic analysis to examine an artifact from the Palmer Site in Massachusetts in the late 1980s. Their examination showed that the artifact was fashioned from smelted brass.

Valerie Monahan (1990) tested 22 samples in the early 1990s from a range of archaeological sites in the Maritimes using electron microprobe (EMP) in order to distinguish between native and smelted copper-based metal artifacts. In EMP, samples are subjected to a small electron beam, causing the excitation of electrons at the intersecting surface location. As the electrons return to their original level they emit x-rays that can be measured and matched to elements present in the sample (Leute 1987:148).

Bradley and Childs (1991) used a combination of metallographic techniques and atomic absorption spectroscopy (AAS) to investigate the spiral and hoop ornaments recovered from Seneca, Onondaga and Susquehannock sites in the Northeast. AAS involves the measurement of visible light (Leute 1987:139). A sample tested in this manner is aspirated into a hot flame. The sample is exposed to light of a wavelength associated with the element of interest. If the element is present, the light is absorbed, causing the upward movement of an electron for that element. The amount of light absorbed may be recorded and plotted to obtain the percentage of that element in the sample. The application of AAS by Bradley and Childs revealed that all of the tested spirals and hoops were manufactured from smelted copper and brass and further that

the five tested samples recovered from the Seneca sites were brass while the samples from the Onondaga sites were crafted from smelted copper.

Penelope Drooker's (1996, 1997) examination of the Fort Ancient Madisonville artifacts employed both visual examination and neutron activation analysis techniques. Her work has highlighted the trade of particular copper-based metal artifacts throughout the Northeast during the early and middle contact periods. The most common advanced analytical technique used in the Northeast on copper-based metals, neutron activation analysis, allows researchers to determine the chemical composition of the metal material through the removal, irradiation and counting of a 10 to 40 mg sample of material from artifacts (Hancock 1976; Hancock et al. 1991; Leute 1987). In NAA, samples are irradiated in a nuclear reactor. Neutrons are absorbed by the elements of the sample and decay to their more stable form by emitting the absorbed energy in the form of gamma radiation. Emissions at specific energies are recorded over time. These emissions are linked to chemical elements through the energies that are produced. Drooker's analysis of the recovered artifacts suggested that the people of Madisonville were receiving some smelted copper-based metals via northeastern Iroquoian groups based on the recovery of fragments attributed to Basque kettles that were introduced via the St. Lawrence Valley (Drooker 1996:174; for a definition of Basque kettles, see Fitzgerald et al. 1993).

Another comprehensive research design that combined the analytical techniques of visual examination, metallography, PIXE and NAA with ethnohistorical research was implemented on a comparable copper-based metal artifact collection recovered from the Haas/Hagerman-Illiniwek Village site by Kathleen Ehrhardt (Ehrhardt et al. 2000; Ehrhardt 2002). This research focused on the reworking of copper-based metals by Illinois craftsmen, recovered from contexts dating to A.D. 1640-1682. Ehrhardt treated these materials as products of a technological system (after Kingery 1993). She strove to explain their manufacture and use through a reconstruction of the technical, behavioural, social, ideological and historical dimensions of the technological style of Illinois metalworking (Ehrhardt 2002, 2005). As part of this research, Ehrhardt and her colleagues utilized proton-induced emission spectroscopy to determine the precise chemical composition of 75 artifacts, which had also been examined metallographically (Ehrhardt et al. 2000). In PIXE, the sample is subjected to a proton beam, much the same way that samples in EMP are exposed to an electron beam (Leute 1987:134). Energy released from the sample area is measured and compared to known elemental energies, thus allowing for the determination of sample chemistry. This technique was used "to differentiate native copper from European-derived smelted copper and to distinguish smelted copper and smelted brass" (Ehrhardt et al. 2000: 281). They were able to demonstrate that smelted copper and brass were used in nearly equal proportions for the manufacture of each of the finished artifact forms that they examined.

Recent Work of Researchers Based in Ontario

Recent work in Ontario has increasingly focused on the use of simple analytical techniques in addition to visual examination of artifacts crafted from European-introduced copper-based metals. One of the most important techniques is the scratch test, which, as it sounds, is the removal of patina in one small area of a copper-based metal artifact. William Fitzgerald and Peter Ramsden first suggested this test in the late 1980s from their work using Neutral copper-based metal collections (Fitzgerald and Ramsden 1988; Fitzgerald 1988). If the uncovered area appears red, the piece is considered primarily copper, whereas if it appears yellow, the piece is considered brass (copper alloyed with zinc). This method was used by Fitzgerald and Ramsden to suggest a dating scheme for sites that yield significant quantities of copper and copper-alloy materials in Ontario (Fitzgerald and Ramsden 1988). Under this scheme, sites that yield more European copper than copper-alloy materials predate A.D. 1600; sites that yield more brass than copper date between A.D. 1600 and 1630;

and sites that yield significantly more brass than copper can be dated between A.D. 1630 and 1650. As a check for the efficacy of the scratch test, many researchers also employ an advanced analytical technique.

In addition to use of the scratch test, there has been much pioneering work using neutron activation analysis on samples from sites in southern Ontario, particularly from Wendat sites, undertaken at the former SLOWPOKE Reactor Facility at the University of Toronto by Ron Hancock, Larry Pavlish and their various colleagues (Anselmi 1995; Anselmi et al. 1997; Fox et al. 1995; Hancock 1976; Hancock et al. 1991; Hancock et al. 1993; Hancock et al. 1994; Hancock et al. 1995a; Hancock et al. 1995b; Hancock et al. 1995c; Hancock et al. 1999; Moreau and Hancock 1993, 1996; Whitehead et al. 1998). The use of this technique allows for the determination of trace element chemistries of the copper-based metal samples taken from the artifacts. Once chemistries of the samples are known, it is then possible to determine the minimum number of kettles present in the sample group, to determine preference of material for artifact type and to suggest trading patterns within and between interacting archaeological sites (Anselmi 1995; Anselmi et al. 1997).

The European-introduced, copper-based metal collections for numerous Wendat sites in Ontario have also been examined under the direction of Martha A. Latta. Many of these collections were recovered through her direction of the University of Toronto field schools at the Wendat sites of Robitaille, Auger and Thomson Walker and through the joint Ontario Archaeological Society-University of Toronto investigations at the Beeton site.

Metallographic research on a small amount of material recovered from several Wendat sites was undertaken by Sandra Zacharias, in cooperation with Martha A. Latta, while she was at the University of Toronto in the early 1980s (Zacharias 1983). Zacharias metallographically examined a small selection of artifacts from four Wendat postcontact sites: Ball, Auger, Robitaille and Beeton (Zacharias 1983). Based on this work, she concluded that all the specimens had been annealed after being hot or, more likely, cold worked (Zacharias 1983:3). The characteristic microstructure of polyhedral equiaxed grains and twins formed by annealing deformed grains was clearly present (Zacharias 1983:3). However, this patterning is typical of seventeenth-century European brass and copper kettles. Kettle manufacture proceeded from sheets of brass or copper that were cast and cut into circles, then either spun on a lathe or hammered into shape on a form (Zacharias 1983:3-4). The metal was worked in a cold state, but softened when necessary by heating above the recrystallization temperature (250-400 degrees Celsius; annealing) (Zacharias 1983:4). Once the kettle was shaped, it would likely be annealed once more at a low temperature to relieve internal stresses and to prevent "season cracking" without softening the metal itself (Zacharias 1983:4).

During the mid-1990s, Martha A. Latta participated with Ron Hancock, Larry Pavlish and William Fox in a neutron activation analysis study of the copper-based metal collection from the Robitaille site (Hancock et al. 1995c). This analysis suggested that a small number of trading interactions could have brought enough copper-based metal into the site to account for all of the sampled copper-based metal artifacts.

Martha A. Latta's more recent work has focused on the identification of copper-based metal fragments that are irregularly shaped but show evidence of working or use on one or more sections (Latta et al. 1998:179, Latta 2004). She has argued that the notion of "scrap metal" is incorrectly applied to these copper-based metal artifacts. Her work has suggested, instead, that these objects may have been used as expedient tools in such activities as hide production (Latta et al. 1998, Latta 2004). She organized a session at the Canadian Archaeological Association meetings in Banff in 2001 focusing on aboriginal use of copper-based metals and she has presented this work at archaeological conferences in Ontario, as well as in more distant places, such as Italy (Latta 1996), in an effort to call attention to the implications of the use of copper-based metal artifacts by aboriginal peoples.

In addition to her own work with Wendat copper-based metal collections, several of her former graduate students have completed master's- and doctoral-level research projects which have

examined smelted copper-based metals using both simple and advanced analytical techniques. The first of these, in the mid-1990s, was my own master's thesis, which used neutron activation analysis in combination with the scratch test and visual examination to explore the copper-based metal collection recovered from the Auger site. Using the neutron activation analysis results from 150 samples, I determined the minimum number of kettles present in the sample group and suggested preference of material for artifact types. I was also able to suggest possible trading patterns within and between interacting populations as reflected by the archaeological assemblages (see above, Anselmi 1995; Anselmi et al. 1997).

Caroline Walker also undertook an analysis of copper-based metal artifacts for her master's research in the mid-1990s (Walker et al. 1999). Her work applied both visual examination and neutron activation analysis to a number of Petun site copper-based metal collections. She used the results of the NAA to assist in the development of a new chronological seriation for the Petun sites. More recently, Paul Thibaudeau's (2002) doctoral research on the Thomson Walker site collection focused on traces of use-wear. His research, which included an experimental component, found that several of the irregularly shaped forms with evidence of working were used for hide preparation.

My own doctoral research sought to broaden our understanding of the use of these metals by aboriginal peoples during the early and middle contact periods through a comparative regional approach (Anselmi 2004). I examined a number of copper-based metal collections attributed to the nations of the Wendat confederacy in Ontario and to the Seneca, Onondaga and Mohawk nations of the Haudenosaunee confederacy in New York. I also examined contemporary collections crafted by European metalworkers in the New World, such as those recovered at French Sainte Marie I and English Jamestown sites. Through this comparative approach and a small experimental study, I was able to demonstrate a predictable difference between the ways that aboriginal individuals were working copper-based metals taken from introduced trade goods and the ways that trained European metalworkers were using similar materials. My post-doctoral research has included the examination of copper-based metal collections attributed to the Susquehannock. Analysis of the collected data continues but preliminary results suggest that the Susquehannock used copper-based metals in very different ways than other Iroquoians.

Without Martha A. Latta's guidance and enthusiasm, none of these graduate student projects would likely have been completed. Marti's commitment to the investigation of copper-based metals, from their excavation to her own research into expedient tools as well as her support of graduate students, is one of the lasting legacies of her long career in Ontario archaeology.

Conclusions

Investigations of the ways that native copper and European-introduced copper-based metals have been used by aboriginal peoples have a long history. Recent investigations of the active ways that aboriginal people chose to recycle introduced copper-based metals have been influenced by Martha A. Latta through both her personal research and her role as advisor to graduate students. Future work suggested by her own and her students' research might focus on expanded use-wear analysis of copper-based metal artifacts as well as implementation of an advanced analytical program to test additional artifacts throughout the Northeast in order to ascertain their chemical signature. Once these data are collected, it may then be possible to trace usage patterns across sites as well as local and regional trading networks.

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Note

[1]The phrase "European-introduced copper-based metals" commonly includes both smelted copper and copper-alloys such as brass, which were introduced into aboriginal cultures following contact with Europeans and may include materials manufactured in European centers such as Nuremberg or altered by Europeans in the New World at early settlement sites such as Jamestown, Virginia (see discussion in Anselmi 2004).

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En Ontario et dans toute la région nord-est de l'Amérique du Nord, on a depuis longtemps reconnu que les groupes des Premières Nations ont utilisé le cuivre natif, ou pur, et les métaux à base de cuivre introduits par les Européens pour fabriquer des objets ornementaux et utilitaires. Cet article présente une brève revue de quelques projets qui ont examiné ce genre d'objets à la lumière de l'usage des métaux. On débute par les enquêtes menées, dans les dernières années de 1800, par Sr Daniel Wilson concernant le cuivre natif utilisé par les Archaïques et on termine avec les recherches récentes entreprises par l'université de Toronto, recherches qui se rapportent à l'utilisation, par les groupes des Premières Nations, des métaux à base de cuivre introduits par les Européens durant les périodes de contact ancienne et moyenne. Cet article souligne en particulier le rôle qu'a joué Martha A. Latta dans ces dernières études, dont plusieurs ont été complétées par des étudiants gradués sous sa supervision.

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