RED-ON-WHITE DRAWN OR CORNELIAN BEADS: A 19TH-CENTURY TEMPORAL MARKER FOR THE PLAINS

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The red-on-white drawn glass bead is an under-used 19th-century temporal marker for cultural objects and archaeological assemblages from Native American and fur trade sites in the Plains region of the United States. This bead variety is referred to as "cornelian" in Plains fur trade records, but is also known by several additional names in other places including cornaline d'Aleppo*,* cornaline*, and* corniola*. By examining bead sample cards, historical references, fur trade ledgers, beaded cultural objects in museums, and beads from archaeological assemblages, it was determined that this bead variety first appears in the latter part of the 1830s in Plains ethnology and archaeological collections. Plains fur trade ledgers first refer to cornelian beads in 1837, and are common therein by the mid-1840s. These multiple lines of evidence provide a chronology for drawn red-on-white beads that is relevant for both the Plains and other regions.*

INTRODUCTION

One of the first questions asked about a glass bead assemblage is: how old are they? Unfortunately, there are few glass bead varieties whose introductions are established precisely enough that their presence can be used to provide a precise date for archaeological assemblages or for cultural objects that incorporate beads. When these varieties are present, they can provide a *terminus post quem*, or the date after which an archaeological assemblage or a beaded object can be placed in time. A common bead that is an underused temporal marker in 19th-century assemblages at Native American and fur trade sites in the Plains of the United States is the red-on-white drawn bead. This bead variety is often referred to as *cornaline d'Aleppo* or as a "white-heart" bead. Immense quantities of glass beads, as well as other trade items, were brought into the Plains in the 19th century to exchange with Native Americans for furs and hides, and among the trade goods were large numbers of red-on-white drawn beads.

Red-on-white drawn beads were made in Venice and probably elsewhere in the 19th century and continue to be made today in several countries. The red glass for these beads was colored with the addition of gold in the early 19th century, but towards the end of the century, the red glass began to be colored with selenium (Allen 2001; Francis 1994:287). Studies of 19th-century glass beads indicate that the location where the beads were made can often be distinguished by glass chemistry. A comparison of the red-glass chemistry from 19th-century red-on-white drawn beads and the rare wound-on-drawn beads from an archaeological site in the northwestern United States (Pl. IXB), reveals that the five tested red-on-white drawn beads have a chemical signature typical of beads made in Venice and that the sampled wound-on-drawn bead is typical of beads made in Bohemia (Burgess and Dussubieux 2007:64-65, 70). The red glass of the red-on-white drawn beads is lead glass that is either potash- or soda-like with lead comprising approximately 9% of the glass which is colored with an average of 247 ppm gold. The red glass for the wound-on-drawn bead is a lead-silica glass that is composed of 49% lead and colored with 122 ppm gold. The amount of arsenic also differs in the two red glasses, comprising 1.4% of the red-on-white drawn beads but is minimal (only 37 ppm) in the wound-on-drawn beads (Laura Burgess 2009: pers. comm.).

There have been a few estimated dates for the first occurrence of red-on-white drawn beads, but these generally lack supporting evidence. Woodward (1965:19) describes them as being "widespread by the latter part of the first half of the 19th century." In Africa, van der Sleen (1980:85) dates their first appearance to the end of the 18th century. Francis (1988:341, 1994:296) estimates that red-on-white beads were made from about 1830, but suggests that they first appear in Alaska in 1884, raising the important point that a bead variety may not be available or desired in all areas and may not become common in an area until years after first being manufactured. Allen (1997:9) dates their first appearance in North American at about 1825 based on archaeological evidence. Ross (2000:162; Table 10) suggests that red-on-white beads are initially present in the Fort Union, North Dakota, bead assemblage during the

1830s. None of the estimates for the first introduction of red-on-white drawn beads provide a detailed evaluation of how the they were determined. The goal here is to review the evidence and establish a usable chronology for red-on-white drawn beads in the Plains region. In the following analysis, red-on-white, red-on-pink, and red-on-yellow drawn beads (Pl. IXB) are all considered together under the term red-on-white drawn beads. While the red-on-pink and red-on-yellow varieties may have distinct temporal spans, there is not sufficient information at this time to examine them separately.

Several lines of evidence will be examined including historical descriptions, bead sample cards, beads on cultural objects in museum collections, beads found at well-dated archaeological sites, and bead descriptions from 19th-century trade ledgers. Consideration of multiple lines of evidence together provides a more comprehensive understanding of red-on-white beads and moderates the limitations of each line of evidence.

HISTORICAL DESCRIPTIONS

Historical descriptions, when available, can provide specific evidence concerning the temporal placement of a particular bead variety. While such evidence provides a date when the bead was available, it is not necessarily the earliest date. Typical historical descriptions are often so general that a specific variety of bead cannot be identified. Because the red-on-white drawn beads are distinctive, they are identifiable in several historical accounts.

A description of the glass-bead industry in an 1841 encyclopedia by Altmütter is the first known mention of the manufacture of red-on-white beads in Venice: "The inside is namely opaque, milk-white, and only the thin exterior layer is a bright red glass" (Neuwirth 1994:206, translation of Altmütter 1841:92). Altmütter also addresses possible reasons for the polychrome manufacture of these beads: "Not only are such tubes cheaper to make, the white opaque foundation also enhances the red color of the overlay" (Neuwirth 1994:150, translation of Altmütter 1841:93). Altmütter establishes that red-on-white beads were being made by 1841 and provides two reasons for their creation: the underlying white layer improved the perceived color of the red glass, and they were cheaper to make, white glass being cheaper than the gold-colored red glass.

In the French-language translation of Dominique Bussolin's description of the Murano bead industry in 1847, the term *cornaline* is used to describe the red color:

> If an opaque white enamel is covered by a ruby-colored enamel, the result is a very bright carnelian [*cornaline*] color. Covering an opaque yellow enamel with that same ruby-colored enamel results in a very pleasant coral shade. In this way, a variety of colors can be produced according to the various qualities of the enamels used (Karklins with Adams 1990:71).

This indicates that *cornaline* was probably used to describe the beads by French speakers soon after the beads were first manufactured. Like Altmütter's account, the underlying color is noted as important for its effect on the color of the overlying red glass, suggesting that the core color was purposefully selected to change the visual properties of the overlying, transparent to translucent, red glass.

BEAD SAMPLE CARDS

On sample cards provided by manufacturers and distributors to advertise their beads during the late 19th and early 20th centuries, red-on-white drawn beads are referred to as *cornaline*, red and yellow *aleppo*, *aleppo*, *corniola perla*, and cornelian. Sample cards destined for French-language markets list red-on-white drawn beads as *cornaline*; e.g., on an 1899 *Societa Veneziana Conterie* card (http://www.picardbeads.com/exhibit8/exhibit/pr87.html, accessed July 10, 2008), on an undated *Carte de Congo* card (Allen 2001), and on a 1924 *Societa Veneziana Conterie* card (Allen 2001; Picard 1988:3).

Sample cards for the Italian-language market identify the beads as *Aleppo* for red-on-white and yellow-on-white beads, such as on an undated Frederic Becher card from Venice (John Picard 2009: pers. comm.). Red-on-white drawn beads are referred to as *corniola perla* on a Nissin Namer sample card (Pls. IXC-XA) collected in 1907 for the Royal Ontario Museum (accession no. 907.31.11) and identified in the museum records as beads used in the Sudan around 1870. *Corniola perla* is also used on an undated Policar & Cannetti card (John Picard 2009: pers. comm.).

Cards for English-speakers include an undated Baker, Baker & Co. sample card from King Williams Town, South Africa, that identifies red-on-white beads as "pound beads" and as "cornelian" (Ezakwantu Gallery 2009). A Randles Bros. & Hudson Ltd. (R.B. & H. Ltd.) sample card from Johannesburg is estimated to date to about 1900, and also lists the beads as "cornelian" (Ezakwantu Gallery 2009). An Edition 1902 card (John Picard 2009: pers. comm.) as well as an Edition 1924 and an Edition 1925 *Societa Veneziana Conterie* sample card (Fig. 1; Pl. XB) identify red-on-white drawn beads as "red *aleppo*" and yellow-on-white drawn beads as "yellow *aleppo*" (Allen 2001; Picard 1988:3).

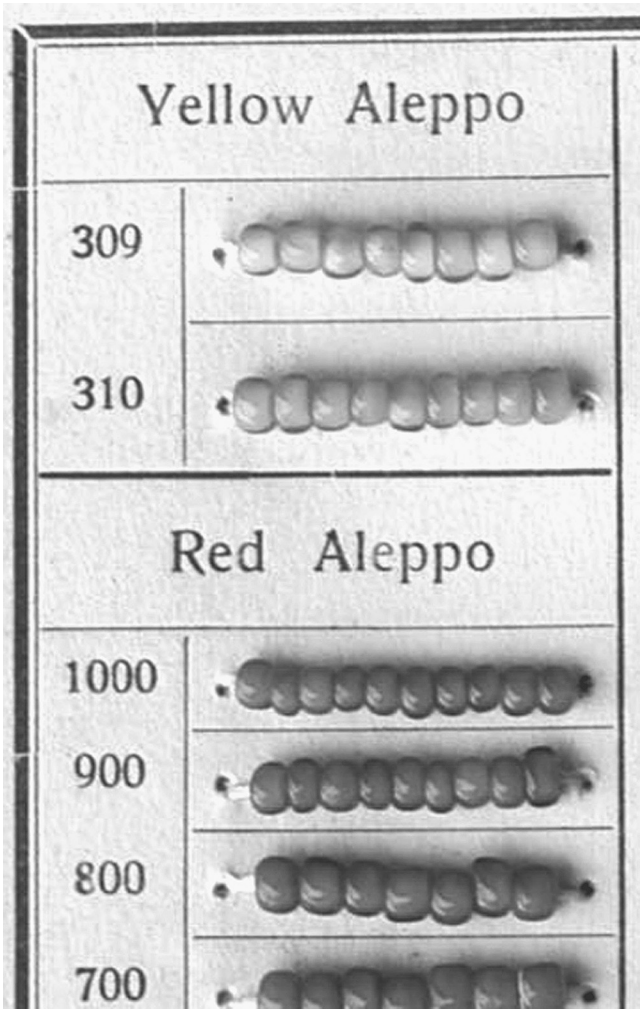

Figure 1. Detail of a *Societa Veneziana Conterie* bead sample card, Edition 1925, that shows "yellow aleppo" and "red aleppo" beads (photo: courtesy of John Picard).

The terminology used is quite interesting. French-language cards refer to the beads as *cornaline*, Italian-language cards use *corniola perla* or *Aleppo*, and English-language cards use cornelian and *aleppo*. It is interesting that *cornaline d'Aleppo*, a name applied to these beads today, combines the French and Italian names for the bead. Allen (1997:10) reports – probably based on an examination of sample cards that have red-on-white drawn beads identified as *cornaline* and as red *aleppo* beads – that this term was applied by Venetians to red-on-white drawn beads and did not originate in France. The term *cornaline d'Aleppo* was not found, however, in the examined sample cards. Today the term is well-known, but its history is poorly understood (Allen 1997, 1998, 2001). The earliest printed reference to *cornaline d'Aleppo* beads is in Haldeman (1878:304, 1879:269) who describes it as a Venetian bead found in a California archaeological assemblage. Haldeman spells the term both as *coralline d'Aleppo* and *cornaline d'Aleppo* and describes the beads as spherical or cylindrical in shape and as occurring in many sizes. His illustration of one of these beads conforms in size and shape to a drawn bead (Haldeman 1879:269). He states that the interior may be white, whitish, yellowish, or pink. Where Haldeman encountered this term and the color variations is an interesting question since these two short articles are the only time he describes glass beads in print. A clue may be Haldeman's statement that the Smithsonian had obtained a collection of 500 varieties of recent Venetian beads (Haldeman 1878:305, 1879:270) which, based on the date of his publications, may have been obtained in the late 1870s. Perhaps Haldeman encountered the term *cornaline d'Aleppo* during an examination of this collection. Unfortunately, no record has been found for the accession of these beads at the Smithsonian and the whereabouts of the collection is unknown.

Allen (1998, 2001) has considered why the term *aleppo* was applied to these beads and postulates that it may be based on a similarity to *aleppo* stones – agates with parallel or concentric colored lines/layers. Allen also mentions that *Aleppo* has been thought to refer to the city of Aleppo in Syria.

Used to designate beads made by several different techniques during various time periods, the term *cornaline d'Aleppo* has acquired such a general meaning that it is presently of little utility. Three groups of beads have been described as *cornaline d'Aleppo* by scholars such as Orchard (1975), Woodward (1965), and van der Sleen (1980): 1) opaque-red-on-transparent-green drawn beads that were made in Amsterdam throughout the 17th century (Karlis Karklins 2009: pers. comm.) and in Venice since at least the beginning of the 17th century through the 19th century; 2) translucent-red-on-opaque-white wound beads that were probably first made in Venice in the early 19th century; and 3) translucent-red-on-opaque-white drawn beads that were probably initially made in Venice and continue to be made today in several countries. The history and reason for why beads of differing manufacture were included under the name *cornaline d'Aleppo* is not revealed in the published literature. Orchard (1975:29) may be the first in print to equate *cornaline d'Aleppo* with red-on-green, red-on-white, and red-on-yellow drawn beads, as well as red-on-white wound beads. Woodward (1965:19-20) also refers to red-on-white, red-on-pink, and red-on-yellow, as well as red-on-green beads as *cornaline d'Aleppo*. Van der Sleen (1980:85) thought that the use of the term *cornaline d'Aleppo* was restricted to the United States and that it referred to red-on-white wound beads. Because of the difference in the history and manufacturing methods of these three bead groups, and since the sample-card evidence indicates that only the red-on-white drawn beads were referred to as *cornaline*

and *Aleppo*, the use of the term *cornaline d'Aleppo* should be restricted to drawn red-on-white, red-on-pink, and red-on-yellow beads, and should not be used for red-on-green drawn or red-on-white wound beads (cf. Allen 1997, 1998).

CULTURAL OBJECTS

One method to assess the introduction of a specific bead variety is to examine cultural objects in museum collections that are well dated by historical records. It should be noted, however, that "well dated" can be a relative term. Museum records reveal when an object was accessioned or formally acquired by the museum, but the records do not always contain information on when the object was first obtained by the collector or donor, how long the object had been in use before being acquired, or when the object was first made. Major museums in the United States were established after red-on-white beads were first manufactured, so collections from the appropriate time period were often obtained by museums years after they were introduced and 19th-century collection records often contain scant information.

Four early collections of Plains objects were examined for the presence/absence of red-on-white drawn beads: the War Department, the Catlin and the Warren collections at the Smithsonian's National Museum of Natural History, and the Jarvis collection at the Brooklyn Museum. The collections at the Smithsonian were examined by the author.

The War Department collection was primarily formed in the 1820s and 1830s with material from the Plains and northeastern United States, and contains 12 beaded objects that were collected before 1842 (Greene et al. 2007). None of these are adorned with red-on-white beads.

Twenty objects from the Plains that were obtained by the artist George Catlin incorporate glass beads. Catlin traveled on the Plains between 1832 and 1836, and, while his trip is described in his book (Catlin 1866) and illustrated in his paintings (Gurney and Heyman 2002), the objects have no associated information about when and where they were obtained. The Catlin objects were donated to the Smithsonian in 1879 and 1881, and the Plains-style objects probably were obtained by Catlin during his 1832 trip to the Northern Plains. Again, no red-on-white beads are present on the objects.

The Nathan Jarvis collection includes Sioux, Chippewa, Winnebago, and Sac objects that he probably obtained while serving as an Army doctor at Fort Snelling in present-day Minnesota from 1833 to 1836. Jarvis later served in the Seminole War in Florida and the Mexican War in what is now the western United States, locations where he may have obtained the Cherokee, Comanche, Caddo, and Seminole objects. All of the objects were donated to the New York Historical Society in 1848, and now form part of the collections of the Brooklyn Museum. The collection has been described (Feder 1964) and eighteen of the beaded objects were probably obtained from Native Americans near Fort Snelling and four beaded objects were likely acquired later. A pair of leggings identified as being of Sioux manufacture is the only object that exhibits red-on-white glass beads. Since the Sioux lived near Fort Snelling and not in areas where Jarvis was later stationed, it is most likely that the leggings were obtained at the fort between 1833 and 1836.

The Warren Collection was accessioned by the Smithsonian in 1866, and was obtained by Lt. Gouverneur K. Warren during military expeditions to the Northern Plains in 1855-1857. The objects and beads in the collection have been individually described by Hanson (1996) and a systematic review of the objects revealed red-on-white beads on 12 of the 42 beaded objects (e.g., Pl. XC).

Comparison of these collections reveals that red-on-white beads were evidently not in the Plains before the early 1830s. One of the 18 Plains objects in the Jarvis collection has red-on-white beads, and its Sioux manufacture indicates that it was likely acquired at Fort Snelling between 1833 and 1836. Based on this one object, red-on-white beads appear to be present but uncommon in the Plains by the mid-1830s. By the time the Warren collection was assembled in the 1850s, red-on-white beads were in common use and are found on 29% of the objects.

Red-on-white drawn beads are present in a collection of Venetian beads at the Technical Museum of Vienna that is thought to date to 1818 (Neuwirth 1994: Fig. 104, 206). Museum records list the beads as "Inventar für Fabrikate an der k. k. technischen Hochschule in Wien vom Jahre 1818 bis 1862" with the added remarks "Geschenke Sr. Majestät des Kaisers Ferdinand I. und Franz Josef I" and "Aus Venedig - 1818" (Waltraud Neuwirth 2009: pers. comm.). This translates as "Inventory for production at the k. k. Technical University in Vienna from the year 1818 to 1862;" "Gifts of their Majesties, Emperors Ferdinand I and Franz Josef I;" and "From Venice - 1818." If these old museum records are reliable, red-on-white beads were made in Venice as early as 1818.

ARCHAEOLOGICAL ASSEMBLAGES

Red-on-white drawn beads appear in the 19th-century but exactly when they make their first appearance requires a detailed examination of a series of archaeological assemblages. These beads are absent from Plains archaeological collections dating to before 1800. While

there are many sites with pre-1800 bead assemblages in the Plains that do not have red-on-white drawn beads, only three sites, Sully (ca. 1650-1700), Larson (ca.1700-1725), and Sturgeon Fort (1776-1780), are included in this comparison to illustrate their absence (Table 1).

Many of the sites that produced red-on-white drawn beads have long occupation periods. For instance, those from the Mandan village of Deapolis in North Dakota were introduced some time during the ca. 1787-1856 occupation. The lengthy life span of the Deapolis site means that any bead present in the assemblage could conceivably have been present as early as 1787 or as late as 1856. Archaeological sites that were occupied for short periods are the most suitable for providing tighter dates for specific bead varieties but unfortunately such archaeological assemblages from the Plains are uncommon. In addition, a short occupation is often associated with a smaller sample size and the likelihood is that only a few of the available bead varieties are represented in the assemblage.

Table 1. Archaeological Bead Assemblages from the Plains and Nearby Areas Organized by Terminal Date of Occupation.

Site	Date of Occupation	Group	Location	Approximate Sample Size of Drawn Beads	Presence of Red-on-White Drawn Beads
Sully*	Ca. 1650-1700	1	SD	5,000	Absent
Larson*	Ca. 1700-1725	1	SD	5,000	Absent
Sturgeon Fort	1776-1780	1	SK	3,000	Absent
Fort George	1792-1800	1	AB	20,000	Absent
Nottingham House	1802-1806	1	AB	3,600	Absent
Fort Manuel	1812-1813, later	1 or 2	SD	100	Present
Engineer's Cantonment*	1819-1820	1	NE	400	Absent
Fort Atkinson*	1820-1827	1	NE	30	Absent
Kipp's Post*	1826-1830	1	ND	5,000	Absent
Leavenworth*	1803-1832	1	SD	100,000	Absent
Windrose	1814-1834	1	IL	24	Absent
Rocky Mountain House	1799-1834	1	AB	10,000	Absent
Fontenelle's Post	1822-1838	1	NE	100	Absent
Davenport Post*	1818-1842	1	IL	33	Absent
Gilbert Post*	1835-1838	2	IA	30	Present
Fort George*	1842-1845	2	SD	5,000	Present
Deapolis*	1787-1856	2	ND	15,000	Present
Fort Pierre Chouteau*	1832-1856	2	SD	8,000	Present
Fort Clark*	1822-1862	2	ND	9,000	Present
Fort Pierre II*	1857-1863	2	SD	5,000	Present
Fort Union	1828-1867	2	ND	100,000	Present
Fort Berthold*	1845-1885	2	ND	5,000	Present
* bead assemblage examined by author					

A conservative date for when drawn red-on-white beads first appear in the Plains can be obtained by examining a series of sites to find the one that has the earliest terminal date (Table 1). The terminal date is the latest one that the site is known to have been occupied and establishes that a bead variety was present by this date. The sites examined fall into two groups based on the presence or absence of red-on-white drawn beads.

The Group 1 sites that lack red-on-white beads are Sully, Larson, Sturgeon Fort (Barka and Barka 1976; Karklins 1981), Fort George (Kidd 1970), Nottingham House (Karklins 1983), Engineer's Cantonment (Carlson et al. 2004), Fort Atkinson (Carlson 1979), Kipp's Post (Woolworth and Wood 1960), Leavenworth (Bass et al. 1972), Windrose (Wagner 2001), Rocky Mountain House (Noble 1973), Fontenelle's Post (Jensen 1998), and Davenport Post (Billeck 2009a). The size of these drawn bead assemblages ranges from 24 to over 100,000 specimens.

The Fort Manuel trading post assemblage has two red-on-white drawn beads that were recovered from a general provenience (Smith and Ludwickson 1981:45) that could be related to the trading post or to a later use of the post area by Native Americans for burial. The presence of this bead variety at Fort Manuel (1812-1813) does not conform to the overall pattern for contemporary assemblages in Group 1 and this would be the earliest reported instance of red-on-white beads. There are several reasons to suspect the association with the post. The absence of red-on-white drawn beads at the nearby Leavenworth site (ca. 1803-1832), is particularly troublesome, since traders at Fort Manuel regularly traded with the nearby Arikara residents at Leavenworth. The Leavenworth site has an assemblage of over 100,000 drawn beads, and if red-on-white drawn beads were available at Fort Manuel, they should also be present at Leavenworth. The few red-on-white beads that are present at Leavenworth are wound. After Fort Manuel was abandoned, a Native American burial was placed there and this probably explains the presence of the red-on-white beads.

The Group 2 assemblages contain red-on-white drawn beads and are represented by the following archaeological sites: Gilbert Trading Post (Peterson 1997), Fort George (Smith 1968), Deapolis (Lehmer et al. 1978), Fort Pierre Chouteau (Billeck 2009b), Fort Clark (Badorek and Ahler 2003; Billeck and Badorek 2003), Fort Pierre II (Burgess 1999; Smith 1960), Fort Union (DeVore 1992, Ross 2000), and Fort Berthold (Smith 1953). Of particular note is the Gilbert Trading Post, an American Fur Company post in Iowa utilized from 1835 to 1838. This site has the earliest terminal date – 1838 – demonstrating that red-on-white drawn beads were present in the Plains region by at least this date.

The archaeological evidence shows that red-on-white drawn beads were first introduced in the Plains by at least 1838, based on a conservative evaluation of the archaeological record. The absence of red-on-white drawn beads in a large sample of beads from sites with terminal dates in the early 1830s indicates that this bead variety was not present in the Plains at this time.

TRADE LEDGERS

Trade ledgers dating from the late 1820s to the early 1850s were examined to determine when red-on-white beads were first introduced into the Plains and when they became common. One of the primary trading concerns in the Plains in the 19th century was the American Fur Company, and these records are now in the Chouteau Collection at the Missouri Historical Society. The available ledgers are of two general types: inventories and invoices. The inventories were typically prepared in June, before the first steamboats arrived with new stock. The inventories do not list all of the items that were available or had been sold at the post, but indicate what remained in stock. The second type of ledger contains invoices for stock received and provides a list of the bead supplies that arrived at a post in a particular shipment. Inventories are not available for every year that a post was in operation and the set of invoices is incomplete.

Copies of original and microfilmed inventories and the transcribed summary of many of the ledgers from Fort Union (DeVore 1992: Appendix a-l) and Fort Clark (Badorek and Ahler 2003: Table 46) were examined. The transcribed inventories were checked against several of the originals, confirming the accuracy of the published transcriptions. Ledgers are available for some years, but not for others. Inventories that provide a listing of what was present at the post at a particular time are available for Fort Berthold (1846 to 1850); Fort Clark (1829, 1831, 1832, 1844-1847, and 1849-1851); Fort Pierre (1832 and 1844-1850); Fort Tecumseh (1827 and 1829-1832); and Fort Union (1831, 1834, and 1844 to 1851). Invoices for the beads that arrived at the posts are available for Fort Berthold (1849 and probably 1850); Fort Clark (1834, 1837, 1839-1841, and 1850); Fort Pierre (1834, 1837-1841, and 1848-1850); Fort Union (1835-1839, 1841, and 1849-1850); and the Rocky Mountain Outfit for 1834, 1836, 1837, 1839, and 1840. The ledgers of the fur trade companies provide general descriptions of the beads that were sold as pound, seed, cut, agate, pigeon egg, snake, common, garnishing, mock garnet, and mock wampum. Unfortunately, the ledgers do not reveal whether the beads are drawn or wound, but do provide descriptions that sometimes allow the identification of the manufacturing types. Beads that are identified as

"pound" beads in the ledgers were sold by weight and these are identified as small drawn beads in this analysis. Support for the identification of "pound" beads as small drawn beads is found on a Sick Co. sample card dating from around 1909 that has very small, small, and medium-sized drawn beads identified as such (van Brakel 2006:73).

The ledger descriptions are often difficult to match up with specific bead varieties found in archaeological assemblages or on cultural objects. No beads are specifically described as red-on-white beads and the term *cornaline d'Aleppo* does not appear in the examined ledgers. The term cornelian, which is used to refer to red-on-white drawn beads on English-language sample cards of the late 19th or early 20th century, is used in the ledgers to refer to the color of beads that were sold by weight and are referred to in the ledgers as cornelian-colored beads or as cornelian-colored pound beads. In the examined fur trade ledgers, cornelian does not appear in the 18 ledgers that have bead entries made between 1827 and 1836. The term appears in only the 1837 ledger of the 16 ledgers that date between 1837 and 1841, but appears in 23 of 36 ledgers that date between 1844 and 1851. The ledgers suggest that while cornelian beads were uncommon in the late 1830s, they were common by the late 1840s, at which time hundreds of pounds of these beads were being sent to the Northern Plains, including one invoice for 857 pounds of cornelian beads for Fort Pierre (Table 2). The earliest usage of the term cornelian is in the ledger for the 1837 Rocky Mountain Outfit.

Cornelian beads were relatively expensive compared to other colors of pound beads. For instance, in the 1846 Fort Union inventory, cornelian pound beads were sold for $0.6867/lb. and for $0.95/lb. The reason for the price difference is not recorded, but may be related to the size of the beads. Pound beads of other colors sold for much less: blue pound beads - $0.565/lb., white pound beads - $0.30/lb., yellow pound - $0.25/lb., and black pound beads - $0.25/lb. In other inventories, cornelian beads sold for between $0.60/lb. and $1.00/lb. (Table 2), substantially higher than the other pound beads.

The examination of mid-19th-century trade ledgers indicates that red-on-white beads were referred to as cornelian beads in the United States as early as 1837, and are common by the late 1840s.

COMPARISONS OF PLAINS TRADE LEDGERS TO PLAINS ARCHAEOLOGICAL ASSEMBLAGES

Another way to look at the importance of red-on-white beads is to examine their occurrence in the trade ledgers and at archaeological sites relative to other small beads. Ledgers and archaeological collections are available for the prominent Plains trading posts of Fort Clark, Fort Pierre Chouteau, and Fort Union. The available trade invoices and inventories were summarized for weight by color for all beads identified as pound or seed beads. Several ledgers only described beads by weight, color, and price and the ledger entries that conformed in price and weight to pound beads were included in the summary.

There are nine inventories and six invoices that date between 1829 and 1851 for the Fort Clark (1822-1862) post (Table 3), eight inventories and eight invoices that date between 1832 and 1850 for the Fort Pierre Chouteau (1832-1856) post (Table 4), and nine inventories and ten invoices that date between 1831 and 1851 for the Fort Union (1828-1867) post (Table 5). What can be learned from the trade ledgers is the general importance of the different types of beads, but this is best done in comparison with archaeological assemblages. If it is assumed that the beads recovered from archaeological investigations at a post are a good indicator of the beads available at the post, the archaeological assemblage can be used to evaluate how well the ledgers represent the bead trade. Comparison of the trade ledgers with the archaeological assemblages reveals that the inventories and invoices from a particular post do not precisely match each other. For instance, at Fort Union there is a marked under representation of white beads in the inventories. White beads comprise only 8.6% of the bead inventories but 49.1% of the invoices of beads shipped to the post. Clearly white beads were very popular at Fort Union and were hard to keep in stock. If only the inventories were examined, a distorted interpretation of the importance of different bead colors would result. While inventories may poorly represent the amounts of beads sold at the post, the invoices are generally much better as they list the beads shipped to the posts. Not all of the invoices have been located, however, and the descriptions of the beads in the invoices may not be adequate to identify uncommon bead colors, leading to biases in the invoices. The invoices listing the beads shipped to the Fort Clark post under-represent the uncommon bead colors in comparison to the inventories (Table 3). The inventories of unsold stock show approximately 80% white and blue beads of small size while about 20% of the beads are the less common colors – black, yellow, red, and cornelian (Table 3). By comparison, less than 1% of the beads listed in the invoices are black, yellow, red, and cornelian, while 99% are white and blue.

Comparing the amounts listed in the invoices with the number of beads recovered from archaeological excavations reveals that the percentage of the colors varies, sometimes substantially. For instance, blue and white beads comprise 90% of the invoices for Fort Union while the excavated

Table 2. Cornelian Beads Listed in the Chouteau Paper Trade Ledgers for the Rocky Mountain Outfit, Fort Clark, Fort Pierre, Fort Union, and Fort Berthold.

Year	Weight (lbs)	Description	Price Per Pound	Post
1837	11.5	Fine	1.00	Invoice Rocky Mountain Outfit
1844	98	None	.69	Inventory Fort Clark
1844	235	Pound	.78	Inventory Fort Pierre
1845	124	None	.68	Inventory Fort Clark
1845	306.25	Pound	.69	Inventory Fort Pierre
1846	23	Pound	.69	Inventory Fort Clark
1846	200	Pound	.69	Inventory Fort Pierre
1846	30	None	.69	Inventory Fort Union (not noted why beads
1846	185	None	.95	vary in cost)
1848	52	None	.68	Inventory Fort Pierre
1848	857	Pound	.65	Invoice Fort Pierre
1849	14	Pound	.65	Inventory Fort Clark
1849	50	Pound	.65	Invoice Fort Clark
1849	523	None	.65	Inventory Fort Pierre
1849	280	Pound	.60	Invoice Fort Pierre
1849	207	Pound	.60	Invoice Fort Union
1849	16	None	.65	Inventory Fort Berthold
1849	43	None	.65	Invoice Fort Berthold
1850	15	None	.60	Invoice Fort Clark
1850	201	None	.60	Inventory Fort Pierre
1850	99	None	.60	Invoice Fort Pierre, forwarded to Fort John
1850	429.5	Pound	.65	Inventory Fort Union
1850	40	None	.60	Inventory Fort Berthold
1850?	42	None	.60	Invoice Fort Berthold
1851	72	Pound	.60	Inventory Fort Clark

assemblage contains 62% blue and white beads. The invoices at Fort Clark have 0.2% yellow and black beads and the excavated assemblage has 10.9%. At Fort Pierre Chouteau, the invoices are the most similar to the archaeological assemblage. The differences in the percentages of bead colors between the inventories and invoices and the archaeological assemblages indicate that the ledgers are not a precise indicator of the importance of the colors of small beads at the posts, but provide evidence for the relative importance of beads. Combining the information from the ledgers and the archaeological assemblages reveals that blue and white beads predominate while the other colors generally make up less than 10% of the total.

Turning to the red-on-white beads in particular, the Fort Clark, Fort Pierre Chouteau, and Fort Union inventories show 1.7%, 12.7%, and 8.2% cornelian-colored beads,

Table 3. Comparison of Small Drawn Bead Colors in the Fort Clark Trade Ledgers and the Archaeological Assemblage.

Ledgers					Archaeological Assemblage*		
Color	Inventory		Invoice		Color	n	%
	lbs.	%	lbs.	%			
Blue	2,017	40.6	2,105	53.8	Blue	3,329	37.4
White	1,670	33.6	1,784	45.6	White	4,025	45.2
Black	404	8.1	5	0.1	Black	447	5.0
Yellow	468	9.4	5	0.1	Yellow	526	5.9
Red	74	1.5			Red or Pink	169	1.9
Cornelian	331	1.7	15	0.4	Red-on-White	388	4.4
					Other	113	1.3
Total	4,964	99.9	3,914	100.0		8,897	100.1

*Archaeological counts from Billeck and Badorek (2003).

Table 4. Comparison of Small Drawn Bead Colors in the Fort Pierre Chouteau Trade Ledgers and the Archaeological Assemblage.

Ledgers					Archaeological Assemblage*		
Color	Inventory		Invoice		Color	n	%
	lbs.	%	lbs.	%			
Blue	5,628	54.5	11,061	39.4	Blue	2,798	33.4
White	1,970	19.1	14,363	51.2	White	4,030	48.3
Black	439	4.3	964	3.4	Black	113	1.4
Yellow	561	5.4	419	1.5	Yellow	103	1.2
Red	410	4.0			Red or Pink	705	8.4
Cornelian	1,317	12.7	1,236	4.4	Red-on-White	320	3.8
					Other	297	3.6
Total	10,325	100.0	28,043	99.9		8,366	100.1

*Archaeological counts from Billeck (2009).

respectively, while the invoices surprisingly have less at 0.4%, 4.4%, and 1.5%. Cornelian beads were more expensive than the other colors and perhaps the difference between the inventories and invoices may be because they sold less quickly and therefore were more likely to remain in stock. The inventories and invoices suggest that red-on-white beads were most common at Fort Pierre Chouteau, followed by Fort Union, and least common at Fort Clark. This is not supported by the archaeological assemblages, however, where Fort Union has the most red-on-white beads (6.3%), followed by Fort Clark (4.4%) and Fort Pierre Chouteau (3.8%). This order of archaeological assemblages corresponds with the abandonment sequence of the posts in 1867, 1862, and 1856, respectively, providing further evidence that red-on-white beads become increasingly common through time.

Table 5. Comparison of Small Drawn Bead Colors in the Fort Union Trade Inventories and the Archaeological Assemblage.

Ledgers					Archaeological Assemblage*		
Color	**Inventory**		**Invoice**		**Color**	**n**	**%**
	lbs.	**%**	**lbs.**	**%**			
Blue	5,857	74.4	5,492	38.6	Blue	39,574	26.6
White	687	8.7	6,763	47.5	White	52,470	35.3
Black	196	2.5	1,002	7.0	Black	17,815	12.0
Yellow	202.5	2.6	305	2.1	Yellow	9,524	6.4
Red	281	3.6	462	3.2	Red or Pink	8,213	5.5
Cornelian	644	8.2	207	1.5	Red-on-White	9,386	6.3
					Other	11,537	7.8
Total	7,867.5	100.0	14,231	99.9		148,519	99.9

*Archaeological counts from Ross (2000:28-34).

CONCLUSION

Red-on-white drawn beads are frequently found in bead assemblages and on beaded objects from the Plains region and are a valuable temporal marker for the 19th century. Several lines of evidence – historical records, ethnographic beaded objects, and archaeological bead assemblages – were used to determine when red-on-white drawn beads first appear and when they become common in the Plains. An examination of historical records regarding bead manufacture reveals that red-on-white beads were being made by 1841. Red-on-white beads on cultural objects are not present in the War Department (ca. 1820s and 1830s) and Catlin (ca. 1832-1836) collections, are present on one object in the Jarvis collection (ca. 1833-1836 and later), and are often present on objects in the Warren (ca. 1855-1857) collection. On cultural objects, red-on-white beads are not present before the early 1830s. There is also tantalizing evidence that the beads may have been made in Venice as early as 1818, but additional research is needed to verify this date.

A review of trade ledgers reveals that the term cornelian can be equated with red-on-white drawn beads. The earliest occurrence of the term in the examined ledgers is 1837, and these beads are commonly listed in ledgers dating to the late 1840s. As for nomenclature, slightly different terms are used to describe red-on-white drawn beads in different languages: cornelian in English, *cornaline* in French, and *corniola* and *aleppo* in Italian. It is not until the late 1870s that the term *cornaline d'Aleppo* is first encountered in the examined historical records, and additional historical research is needed to precisely date the introduction of these terms.

The lines of evidence indicate that red-on-white drawn beads were in use in the Plains by the mid-1830s, but are uncommon at this time. By the mid-1840s they are often listed in the trade ledgers and are commonly used on objects collected in the 1850s. Red-on-white drawn beads are a distinctive, fairly common, well-dated bead type in the Plains that provides a good index for more precisely assessing a minimum age for cultural objects and archaeological assemblages from the region.

ACKNOWLEDGEMENTS

Information on bead sample cards in the collections of other museums was a great aid in completing this article. John Picard provided information on bead cards and an image of the 1925 bead sample card. Waltraud Neuwirth shared accession records for beads at the Technical Museum of Vienna. The Royal Ontario Museum provided images of the Nissin Namer bead sample card and Trudy Nicks summarized the information on the accession history of the card. Jamey Allen generously shared an updated version of his previously published article on Cornaline d'Aleppo beads. Laura Burgess commented on several drafts of this article. Don Hurlbert photographed the beads.

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