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Beyond Oral History: A Nineteenth Century Blackfoot Warriors' Biographic Robe in Comparative and Chronological Context

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Abstract Biographic tradition artworks produced on the Great Plains by historic-period Native Americans constitute genuine documents of history, recording—in narrative form—real events that took place in people's lives. In the early 2000s, a previously undocumented example of a painted robe in the biographic tradition became known (the "Malcolm robe"). Preliminary assessment indicated an origin on the northern Plains, possibly by artists of the Blackfoot Confederation. We first discuss comparative Biographic tradition evidence for the origin of the Malcolm robe, extending previous commentaries on the ethnocultural affiliation of this robe. Several diagnostic features of this robe confirm that its most likely ethnocultural origin was Blackfoot. We also list features that support a case that more than one artist was involved in its production. The central focus of our study here was to more reliably establish a date for the painting of this robe using a series of quantitative and statistical comparisons with better-dated examples of Blackfoot biographic robe art. We apply three different dating methods: frequency seriation, occurrence seriation, and a multivariate statistical method. All three methods consistently indicate that the robe dates prior to 1850, confidently supporting a date of at least that age. The analyses and comparison with other similar robes more tentatively indicate a possible date of production during the 1830s. Further historical research urgently awaits this robe. However, with a date of pre-1850 now reliably secured, the robe takes its place as an early nineteenth century example of Blackfoot biographic art, and as part of the historical legacy that this body of documentary art comprises.

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Great Plains Biographic Art: History on Rocks, on Robes, and in Ledgers

Historical archaeology, especially in North America, has seminally been defined as the study of "cultural remains of literate societies that were capable of recording their own history" (Deetz 1977: 5). The potential difficulties of this definition with regard to peoples who were well aware of, and recording, their own histories long before literacy through strong oral traditions has been explored elsewhere (e.g., Little 1996; Pikirayi 2006). Certainly, as the pages of this journal attest, there *is* merit in specifically studying the material remains of colonial and post-colonial societies, especially when emphasis is on those who may have been poorly served by the written record (Lightfoot 1995; Little 1996). Hall and Silliman (2006: 2) have usefully suggested that historical archaeology might be better thought of, not primarily in terms of its connection with literacy, but as "an archaeology of the modern world" (following Orser 1996), although study of this archaeological record inevitably takes place alongside consultation of a rich textual record. Nevertheless, the difficulty of a definition of historical archaeology as it relates to "literate" societies "capable of recording their own history"—even if emphasis is placed on direct material forms of historical recording and specifically "documentary" media—is perhaps further highlighted with reference to Biographic tradition artwork produced by Native American societies on the Great Plains during the eighteenth and nineteenth centuries.

Biographic tradition art first appeared in the late prehistoric period but reached its apogee during the mid-nineteenth century (Fig. 1). Biographic tradition art on the

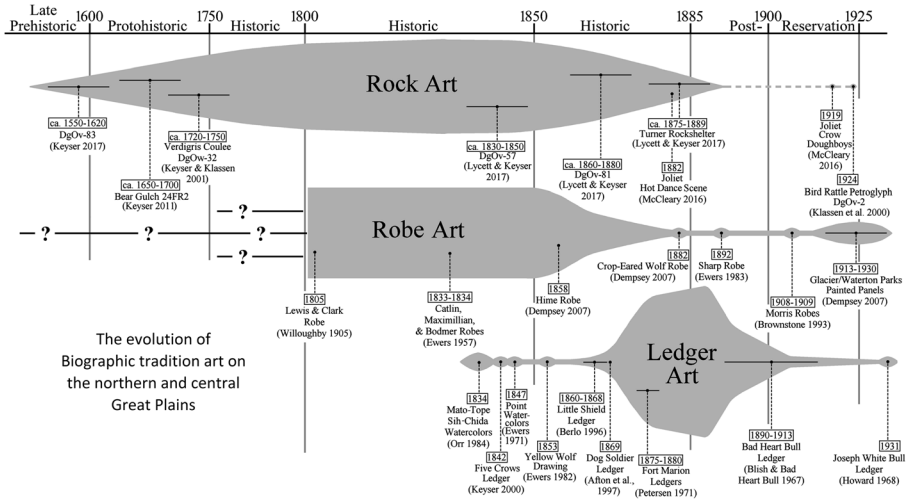

Fig. 1 The evolution of biographic tradition art on the central and northern Plains. Biographic art was undertaken in three media: rock art (petroglyphs and pictographs), painted hides and panels ("robe art"), and on paper ("ledger art"). As shown here, biographic rock art preceded documented examples of robe art, while ledger art began to replace earlier media as indigenous peoples were increasingly relocated on reservations during the late nineteenth century

northern Plains is initially visible archaeologically in rock art of the late prehistoric period, whereupon typical ceremonial tradition motifs such as "boat form" horses, shield-bearing and V-neck human figures begin to be arranged into more narrative-driven compositions showing actions such as horse raiding and interpersonal combat (Keyser 1977, 1987: 45–47, 2017; Keyser and Cowdrey 2008). Biographic art was drawn and painted by male warriors to record their actions, exploits, and items captured during inter-tribal conflicts and was chiefly undertaken in three media: rock art (petroglyphs and pictographs), painted hides and shirts ("robe art"), and on paper ("ledger art"). Extant works in these three media follow each other sequentially from a chronological viewpoint (Rodee 1965; Keyser 1989, 1996; Keyser and Klassen 2001), although in the case of robe art at least, it is plausible that examples were painted concurrent with the earliest rock art examples, yet simply none survive (Fig. 1).

The defining feature of biographic tradition artwork is its explicitly *narrative* content (Keyser et al. 2013), whereby simple, stylized images are used primarily to convey a documentary story of events as a sequence of related actions (Brownstone 1993; Dempsey 2007; Ewers 1983). The "animated" character of these sequences was achieved through use of conventions such as flying bullets and arrows, footprint trails, and horse hoof tracks through a scene which conveyed the sequence of actions. This use of animated conventions creates a temporal sequence of events in which even past and present tenses can be indicated (Keyser 1996: 52) and a simple "grammar" comprising subject, object, and predicate (Greene 1985, 1996). As reflected in the economy of style, aesthetic elements were generally of secondary concern to their authors (Ewers 1945: 22, 1968: 7–8; Szabo 1994: 7). Rather, the primary function of these artworks was to document real events and people—historical events and deeds that had taken place in people's lives (Brownstone 1993; Dempsey 2007). Edwin Denig, who was probably originally writing in 1854 (Hewitt 1930: 377), noted that for a warrior wearing a hide painted with such actions, "his biography is carried on his back" (Denig 1930 [1854]: 605). Indeed, early scholars and ethnographers with first-hand experience of the communities responsible for its production, frequently referred to biographic art as "picture writing" (Denig 1930 [1854]:603; McAdams 1919; McClintock 1936; MacLean 1896; Mallery 1893; Wissler 1911: 36). Such sentiments correctly reflect the fact that biographic tradition artworks represent genuine documents of history (Ewers 1968; Keyser and Cowdrey 2008; Lessard 1992; Wong 1989).

Several examples of ledger art and robe art are known with transcriptions and annotations relaying their contents in words—often in the first person by the warrior artists themselves—which greatly assist in correctly understanding the function of conventions used (e.g., Brownstone 1993, 2005a, 2015; Dempsey 2007; Keyser 2000; Petersen 1971; Schultz 1962: 264-270; Wissler 1911: 37-38). The existence of such examples provides something of a "Rosetta stone" (Keyser 1987, 1996, 2013) and means that the general meaning and sequence of events in other Biographic tradition examples can often be inferred (Keyser 1989; Keyser and Cowdrey 2008; Keyser and Klassen 2003). Blind tests have shown that application of principles derived from examples with annotations can lead to an accurate rendition of at least the main events within a given scene (Keyser 2000: 32).

The detailed study of the content of biographic-tradition mobiliary art (robes and ledgers) has also proven to be of considerable assistance in the archaeological study and understanding of rock art (Keyser 1989, 2004, 2007; Keyser and Klassen 2001, 2003;

Keyser and Mitchell 2001; Lycett and Keyser 2017). In particular, their (frequently) greater documentation of collection histories and the greater use of color and more fine-grained stylistic detail in ledger and robe art has enabled the building of a "lexicon" of biographic picture conventions to be constructed (Keyser 1987, 1996, 2013; Petersen 1971). In turn, addition of new information about particular mobiliary art specimens, leads not only to a greater understanding of the items themselves, but has widespread implications for the study of Biographic tradition art as a whole in terms of their value as historical documents. Accordingly, the discovery of new biographic examples or the more detailed study and documentation of known samples, constitutes a major contribution with respect to a broad array of issues, including a better understanding of those known archaeologically in the form of rock art (Bouma and Keyser 2004; Brownstone 1993, 2015; Dempsey 2007; Keyser and Cowdrey 2008; Lessard 1992).

One—diminishingly infrequent—instance of an unknown robe coming to light in recent years is that of the so-called "Malcolm robe" (Fig. 2), which to date, has only been commented on briefly (Brownstone 2001, 2014, 2015:14–15; King 2001). Indeed, the authors of these brief commentaries themselves note that further study is a priority. As with all biographic tradition art, of central and immediate concern with respect to the Malcolm robe, is an increased understanding of its ethnocultural affinities and its age. As Brownstone (2001: 249) has highlighted, "[f]uller understanding of these

Fig. 2 The Malcolm robe (ROM, Acc. No. 2006.79.1). The maximum height–width dimensions of the robe are 183 × 183 cm (King 2001: 73). Image reproduced courtesy of the Royal Ontario Museum, with permission

paintings and their larger social meaning depends on our ability to identify their age and cultures of origin." We might also add, building on the points made above, that accomplishment of correct ethnocultural affiliation and date attribution also helps important examples of robe art take their proper place within the wider sequence of biographic tradition art seen in ledger art and, more importantly, archaeological examples of biographic rock art. With these related aims in mind, this paper has two discrete goals. We first comment on and qualitatively describe features that are relevant to the ethnocultural affinities of the Malcolm robe through a comparative approach, expanding on previous suggestions that the robe is likely of Blackfoot (*Niitsítapi*) origin (Brownstone 2001, 2014, 2015:15). Secondly, through a series of three quantitative and comparative analyses we aim to more precisely determine its age.

The Malcolm Robe: Background and Ethnocultural Affiliation

The painted biographic robe that has come to be known as the "Malcolm robe" (Fig. 2) was acquired in the 1950s by a private individual from an estate sale at Potalloch House in Scotland, family home of the head of the Malcolm clan (Brownstone 2001: 252, 2014: 24). The historical and cultural significance of the robe was not, however, fully appreciated until the year 2000 when the robe was loaned by its then owner to the British Museum in London (King 2001). The robe was subsequently transferred to the Royal Ontario Museum of Canada in 2006 (Acc. No. 2006.79.1) where it now resides permanently (Brownstone 2014: 24). As described in a series of brief commentaries (Brownstone 2001, 2014, 2015: 14–15; King 2001) the surface of the robe displays narrative scenes and tallies of captured objects typical of Plains Indian Biographic tradition art.

On the basis of its stylized human figures including "hourglass" (or "x-shaped") and rectangular figures, Brownstone (2001: 262, 2014: 25) has suggested the robe is possibly of Blackfoot origin. However, when placed in more detailed comparative context, in combination with consideration of several features of the robe that have not previously been commented on in detail, the overall case for a Blackfoot origin can be strengthened considerably. In addition to the hourglass-shaped humans, other notable features indicative of a Blackfoot authorship are the style of "capture hands," the depiction of fortified enemies, and a specific form of medicine bundle.

The hourglass figures, of which 11 appear on the Malcolm robe, are as Brownstone (2001: 262, 2014: 25) has previously indicated, one of the most obvious features potentially diagnostic of a Blackfoot heritage. The elongated, one-legged, lateral-view forms shown on the Malcolm robe have a body that is fully hourglass in shape. Hourglass humans occur on several documented Blackfoot examples of biographic robe art including examples collected in 1833 by Karl Bodmer and Prince Maximilian of Wied through to examples from the reservation period (Bouma and Keyser 2004; Brownstone 2001; Dempsey 2007: 32). Indeed, Blackfoot robes overwhelmingly account for the majority of examples known from mobiliary biographic tradition artworks (Brownstone 1993; Ewers 1983; Dempsey 2007), but they also occur in at least one Blackfoot winter count (e.g., Bull Plume 1910). In the case of rock art, hourglass humans occur almost exclusively at Writing-On-Stone Provincial Park, Alberta, which is at the heart of the territory known to be occupied by the Blackfoot

during the historic period (Keyser 1977; Keyser and Klassen 2001) or at sites such as Explorer's Petroglyph and Crossfield Coulee, both of which are considered to be the work of Blackfoot artists (Bouma and Keyser 2004: 11–12).

The hourglass humans on the Malcolm robe are of an elongated form, slightly different from those commonly seen in Blackfoot artworks (e.g., Bouma and Keyser 2004; Brownstone 2001; Dempsey 2007: 32; Keyser 1977). Brownstone (2001: 262-263) briefly mentions points of comparability between the Malcolm robe and two robes collected by Prince Maximilian in 1833. While one of these robes is relatively well known and illustrated (e.g., Dempsey 2007: plate 1; Thomas and Ronnefeldt 1982: 17), the same is not true of the second. However, we located the only published image of this latter robe (Krickeberg 1954: plate 5) and compared it to the Malcolm robe. The robe is part of the Maximilian collections now housed at the Ethnological Museum of Berlin (Acc. No. IV B 199). This robe was collected from a Blackfoot (Piegan) source at Fort McKenzie, Montana, between August 9 and September 14, 1833 (Krickeberg 1954: 58–59). The robe largely consists of tallies of weapons captured in battle. However, one scene depicts a single killed enemy portrayed as an hourglass style human (Fig. 3). The form of this figure is of an elongated hourglass type, of the same configuration as those depicted on the Malcolm robe, a similarity also noted by Brownstone (2001: 262). Moreover, the lower portion of the body on the Maximilian figure is formed by the lower triangle of the "X" and the addition of an adjoining inverted triangle, which forms the upper part of the leg. At least five of the hourglass figures on the Malcolm robe also possess this triangular appendage below the main body. The only slight difference between the figure drawn on the Berlin Maximilian robe and those on the Malcolm robe is that the former has a V-neck incorporated into the upper body rather than a squared form where the neck or head joins the main body. However, V-neck humans are common on the Malcolm robe (occurring 43 times) and

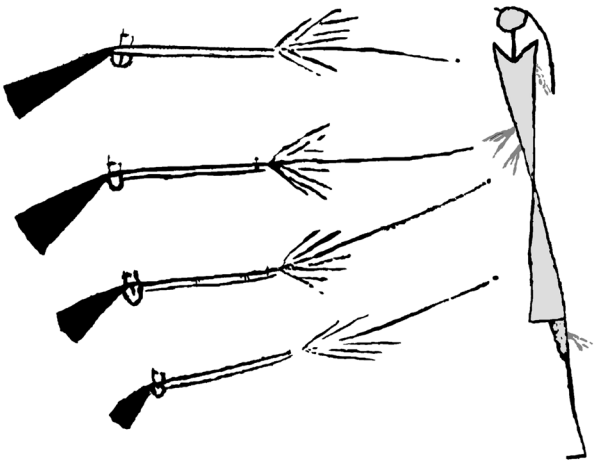

Fig. 3 Scene from Blackfoot (Piegan) robe collected by Prince Maximilian of Wied at Fort McKenzie in 1833. The robe is now held at the Ethnological Museum of Berlin (Acc. No. IV B 199). Imagery on this robe consists primarily of tallies of weapons and a pipe captured in battle. However, one scene (shown) depicts the killing of an enemy. Four gunshot wounds (three in the upper body and one in the leg) are depicted. Aside from the incorporation of a V-neck, this human hourglass figure is almost identical to that of several human images on the Malcolm robe. Drawn from black and white photograph in Krickeberg (1954)

there are even V-neck hourglass body humans found in rock art at Writing-On-Stone and Atherton Canyon that have been identified as Blackfoot (Keyser et al. 2012:64–65, 236–237). Magne and Klassen (1991) were the first to show that there was a likely connection between V-neck figures in rock art to the Blackfoot as the latest users of Writing-On-Stone, Alberta. Klassen's (1995) subsequent thesis and an article (1998) made the same argument, using V-neck figures in rock art scenes at Writing-On-Stone for support. Subsequently, this connection between V-neck forms in rock art and biographic robes was noted (Keyser and Klassen 2001). In sum, it has for some time been recognized that V-neck humans at Writing-On-Stone and nearby sites have a Blackfoot affiliation, geographically and archaeologically, independent of robes. Accordingly, the variant hourglass body style humans found on the Malcolm robe can be confidently identified as Blackfoot.

The extensive use of the "capture hand" convention on the Malcolm robe also helps establish its Blackfoot origin. The capture hand, drawn as a disembodied, open hand shown performing a variety of war honors, is one of the most versatile elements in the Plains biographic art lexicon. It occurs in a variety of guises including taking a weapon or other war trophy, capturing an enemy, and counting a direct "empty-hand-touch" coup on an enemy. However, one type of "capture" hand is significantly different than these others. It uses a disembodied hand—which we term an "action hand"—not to actually perform the deed, but instead to hold a weapon or other item that is shown performing a deed (Fig. 4). Action hands can range from a hand holding a knife that cuts a rope to steal a horse (Wissler 1911:41), to a hand holding any sort of weapon used to strike or kill an enemy. Although capture hands are found occasionally in all major types of biographic art (Keyser 2014:4–5), the action hand is much less common

Fig. 4 Detail of scene from upper right of Malcolm robe showing disembodied trident-style "capture hands" (left) and disembodied trident "action hands" holding guns (right). In this scene, the shield-bearing hero (right) is mounted on horse and kills two opponents. He first shoots one enemy (line of five dots is used to indicate flight of shot extending from muzzle of gun). A through-and-through wound in the chest flows with blood on both sides of upper torso and another in the neck has blood on both sides. Foot tracks from the horse show he approached this enemy. The second enemy, just to the left of the first, is then shot by floating gun shown above these two people. Trident "action hands" are shown holding both guns. Behind (to left of) this second enemy is a row of four knives with a trident capture hand showing that these were captured as war trophies. To the left of the four knives is a decorated feathered lance/staff that also has a trident capture hand showing that it was a captured. Finally, at the far left is a quiver also showing a trident capture hand. Vignette drawn by JDK from high-resolution photograph and assisted by tracings in Brownstone (2015) and King (2001)

than other types. It is most frequently found in Blackfoot robe art. In addition to the Malcolm robe, it has been identified on five other Blackfoot pieces—two war shirts, the Foureau robe, Running Rabbit's robe, and Bear Chief's war tipi (Brownstone 1993:21, 47, 49, 2001:250–255; Horse Capture et al. 1993:85–86, 101; Wissler 1911:38–41). Action hands are portrayed nine times on the Malcolm robe.

Malcolm robe capture hands are drawn using two primary forms—realistic and trident. Detached capture hands are most common in biographic art of the Blackfoot and the Crow. However, Crow-style capture hands are distinctive from Blackfoot examples in being more comb-like and often shown with a curved thumb (Brownstone 2001: 259; Keyser and Klassen 2001: 266–267), no examples of which occur on the Malcolm robe. Of the 53 examples on the robe, nearly 70% are of realistic type generally showing five digits (Fig. 5). All but two of the remaining 17 examples are of the trident shape. The more realistic style capture hands are similar to several found in rock art scenes at three Wyoming sites and another in Montana (Keyser 2014: 7–9) and other similar ones occur on painted war shirts of probable Lakota and Mandan authorship (Keyser 2014: 5; Maurer 1992: 184–185). None of these latter examples can reasonably be attributed to Blackfoot authorship. However, both realistic capture hands

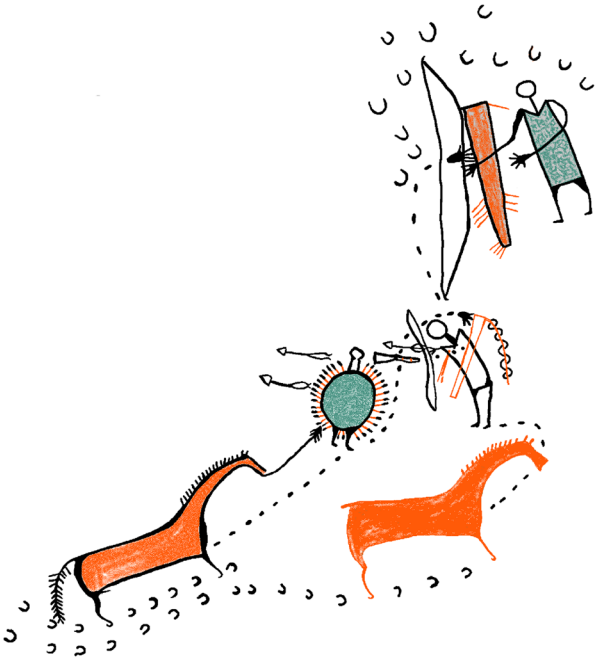

Fig. 5 Detail of scene from upper-center portion of Malcolm robe showing realistic capture hands. The scene depicts two battle actions by hero (shown at center holding shield decorated with feathers). The hero and opponent both ride up on horses from left of scene. Enemy shoots two arrows but both miss, as he nocks a third arrow, the hero (who is still holding his horse's rein—the action hand at the lower left of the shield) shoots the enemy with a gun. Hero then runs toward enemy and takes his quiver as indicated by capture hand. The second action begins from the first combat, as hero's tracks lead from first defeated enemy to second enemy. Tracks indicate hero runs up to enemy and takes bow and quiver. Capture hand, shown taking these two items together, has five digits. Vignette drawn by JDK from high-resolution photograph and assisted by tracings in Brownstone (2015) and King (2001)

and certainly the trident form are more commonly associated with Blackfoot biographic robe art than that of any other tribe (Brownstone 2001: 259; Keyser 1996). So far, the trident form is found only in Blackfoot biographic art—on robes and war shirts, and at one site in the Verdigris Coulee area of Writing-On-Stone (Keyser and Poetschat 2012:40–45). Accordingly, these point strongly toward a Blackfoot heritage.

A single line surrounding a group of humans, animals, and/or material culture items represents a defensive breastwork fortification (entrenchment) in Plains biographic art (Dempsey 2007: 34; Keyser 1996, 2007). Such a fortification symbol could indicate anything from a buffalo wallow or prairie coulee in which a war party sought shelter, to a deliberate construction of brush, logs, or stones, which served the same purpose. A variety of such defensive positions are reported in Plains ethnographic and ethnohistoric sources (e.g., Ewers 1955: 211; Hoxie 2000; Nabokov 1967: 37; Nabokov and Loendorf 1994: 4, 66–4, 70; Schultz 1962: 269), and enemy combatants' entrenchments are routinely shown this way in rock art, robe art, and ledger drawings (Afton et al. 1997: xxii, xxviii, 48–49, 124–125, 274–275; Brownstone 1993: 14–15, 23, 25, 52–54; Keyser 1977, 1996, 2000; Mallery 1893: 282). In one of the actions depicted on the lower-left portion of the Malcolm robe (Fig. 2), the hero of the scene braves a fusillade of fire from a stacked array of eight guns (being wounded three times during that action) and then a trail of footprints shows that he ran toward a fortification of some type to take a fringed bag, blanket, or similar object that is decorated with a large painting of a bear paw. The fortification is represented by a roughly circular line surrounding the war trophy and situated just behind the defenders' stacked firearms. This depiction is very slightly different than dozens of others found in Blackfoot biographic art (e.g., Keyser 2007: 19–20; Keyser et al. 2014: 56), because the defenders' guns are drawn outside of the fortification, rather than extending out from inside it. However, a similar "external" grouping of firearms occurs on the Foureau robe, which is attributed to a Blackfoot artist (Brownstone 2001: 250–252).

This type of fortification convention is typical of Blackfoot robe art (Keyser 2007: 19–20), but also occurs in several Blackfoot rock art scenes (Kaiser and Keyser 2015: 180). Although the fortified enemies convention was used by several tribes, among whom were the Lakota, Cheyenne, Flathead, and Crow, by far the overwhelming majority of such images are drawn in Blackfoot robe art. In contrast to the one or two known examples from each of these other groups, more than 70 such depictions are found on Blackfoot robes, war shirts, tipis, and tipi-liners painted in the century between 1825 and 1925 (Dempsey 2007: 215–245; Keyser 2007: 20). In rock art, the only eight examples so far recorded occur at five sites that have all been identified as Blackfoot based either on their location in Blackfoot territory or their association with other characteristic Blackfoot imagery. In short, the fortified enemies depicted on the Malcolm robe also point toward a Blackfoot origin.

Small animal and bird images sometimes drawn in Plains biographic art are intended to represent "medicine bundles," which were a major feature of Plains Indian religion (Keyser 2008; Wildschut and Ewers 1960; Wissler 1912). Two types of such bundles were common in Plains societies. One was the group bundle that contained "corporate" medicine used for the benefit of the band or tribe as a whole. More commonly illustrated in biographic art was the personal medicine bundle. Such items were usually made of the skins of small animals or birds and were

assembled to reflect the nature of a man's vision experience. Medicine bundles were believed to be a source of spiritual protection during warfare and also to assist in the capture of horses, property, or the counting of coups on enemies. Animal-skin medicine bundles of this type are regularly depicted in Blackfoot art, but also occur less often in the work of other Plains tribes (Keyser and Klassen 2003). A rare example of a medicine bundle in rock art is known from Writing-On-Stone in the heart of historic-period Blackfoot territory (Keyser and Klassen 2003).

At least three such bundles occur on the Malcolm robe, while a fourth may be depicted as part of a series of captured items. The depiction of several bundles of this type is consistent with Blackfoot authorship of the robe. However, one of these medicine bundles in particular, which is shown hanging as decoration from a horse's mouth region (Fig. 6), is especially indicative of a Blackfoot attribution. The small, yellow-colored animal is clearly suspended from the horse's head in the position of a bridle decoration (Keyser and Mitchell 2001) and has short legs and a long, black-tipped tail. While absolute species identification is difficult in depictions of this type, the overall form of the animal and its black-tipped tail would be consistent with it representing a species of the genus *Mustela* (commonly referred to as ermines, stoats or weasels); either *M. erminea* (short-tailed weasel) or *M. frenata* (long-tailed weasel). Both of these mustelid species have a coat that is pale in color on the underside and rich-brown on the dorsal side during the summer, turning white during the winter months (Whittaker 1996: 759–764). Ermine skins in the white winter-coat phase were commonly used to decorate Plains Indian garments and headdresses (Koch 1977: 42; Wissler 1912: 111).

At present, the exact form of this bundle as depicted on the Malcolm robe (see Fig. 6) is unique in Plains biographic art, but it hangs in exactly the same position as is typical of many depictions of a Blackfoot type of halter (bridle) decoration that was

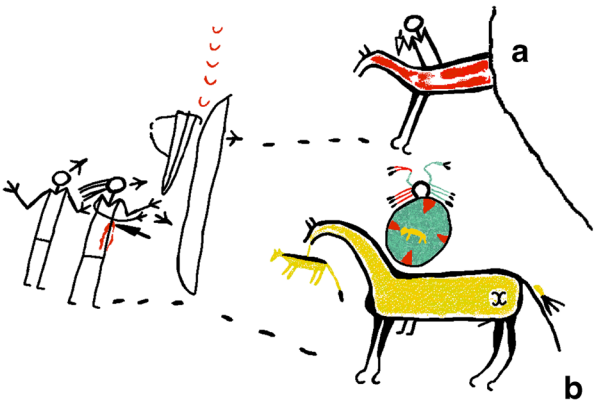

Fig. 6 Detail of scene from the Malcolm robe showing horse with "reverse C, C" brand and distinctive animal-skin medicine bundle hanging as a decoration from the horse's bridle. Narratively the scene depicts "Horseman A" holding a knife riding a red horse, who dismounts (footprints) and takes a bow and quiver as indicated by capture hand. "Horseman B" also dismounts and approaches two enemies. Action hand just above knife that inflicts a wound to enemy's torso appears to be holding this weapon, while a capture hand touches this enemy on head. An additional capture hand touches the second V-neck enemy on head. These capture hands touching foes' heads may indicate a coup count touch or the taking of scalps. Vignette drawn by JDK from high-resolution photograph and assisted by tracings in Brownstone (2015) and King (2001)

named, literally as "a thing to tie on the halter" (Keyser 1991; Keyser and Mitchell 2001: 197–198; Wissler 1912: 107, 1913: 457; see also Brownstone 2005a: cover). These "rake type" decorations (Keyser 1991: 261) typically hang horizontally from the halter, being formed of a bar with hanging decorations. Wissler (1912: 107) classified such decorations as medicine bundles in themselves, and Ewers (1955: 277-278) notes that they were considered as horse medicine, and some "were trimmed with strips of white weasel skin. .. [and] wrapped in separate bundles when not in use." A rake-type decoration is illustrated on Sharp's robe, a documented Blackfoot example whose scenes were transcribed in full by the physician Z.T. Daniel, who obtained an account of the robe's contents from its author at the time of its painting in 1892 (Dempsey 2007: 71–75; Ewers 1983). In describing the scene bearing the halter decoration, Daniel's wrote: "The fringe work suspended from the horse's mouth is a stick fastened transversely to the bit, from which [are] suspended from twelve to fifteen weasle [*sic*] tails, when they assume the white color with black tips" (Dempsey 2007: 73). It would not be a great leap from considering such decorations as bundles, keeping them in bundles, and trimming them with weasel skin, to simply using (or at least portraying) the complete weasel skin as a bundle in the place of the more typical halter decoration, as shown on the Malcolm robe.

The dark "stripe" along the back of the animal depicted on the Malcolm robe (see Fig. 6) may represent an ermine in summer coat. However, a second possibility is that the animal is an ermine in winter coat (i.e., without dark stripe) and that the stripe represents a wooden "bar," which according to ethnographic accounts, appears to have been an important element within the construction of these particular type of horse-medicine bundles (Ewers 1955: 277) and certainly makes a definite appearance in other biographic art examples of this type of halter decoration, including rock art and ledger art (Bouma and Keyser 2004; Dempsey 2007: 73; Keyser 1991, 2007; Keyser and Mitchell 2001; Wissler 1913: 457). Wissler (1913: 457) referred to these as "cross bar sticks." If this is the case here, such a feature would obviously make an even stronger connection to the rake-type decorations recorded on Blackfoot robe art, ledger, and rock art examples. To some extent, given what we know from directly recorded and annotated examples of narratives that accompany other examples of biographic art, the meaning of the dark stripe along the back of the animal would depend on the communicative intent of the artist. If their intent had been to indicate "ermine" then a dark stripe may have been important; alternatively, if they had explicitly wanted to indicate a specific type of horse-medicine bundle then the bar may have been significant to the scene's author. Either way, the association of a likely ermine bundle in the form of a horizontally organized halter decoration, most closely associates with documented examples of Blackfoot horse medicine, and accordingly, adds another indicator of that ethnocultural affiliation.

To summarize, in combination there are several features that indicate the most probable tribal affiliation for the Malcolm robe is Blackfoot. The presence of these features should be considered alongside the fact that there is no equivalent combination of features visible on the robe that could be used to make a viable case for an alternative tribal origin. Indeed, there are no unambiguous examples of features (e.g., Crow-style capture hands) that typically lend themselves to tribal affiliation occurring on the robe that would lead to contradiction of a Blackfoot attribution. Accordingly, at the present time the evidence convincingly indicates that the robe should be considered a Blackfoot work of art.

A question that arises from examination of the images on the Malcolm robe, however, is whether more than one artist was involved in its production. If a single artist was involved then stylistic uniformity might be expected. However, and as briefly hinted at by King (2001: 74), several stylistic discrepancies in the imagery on the Malcolm robe indicate the hand of more than one artist. King (2001) specifically notes disparity in the variety of ways the hero of individual scenes is depicted in terms of headdress styles. However, other elements within the robe also suggest that more than one artist was responsible for its authorship. For instance, variation in horse styles—one of the more complex figures illustrated on robes—has been recognized as a means by which the work of multiple artists might be recognized (Brownstone 2015: 43–44). In the case of the Malcolm robe, stylistic differences between horses in various scenes can be marked. For example, in some scenes horses are drawn with "looped" or crenulated manes (Fig. 7) while in others they are drawn with pinnate tails and manes (see Fig. 5), and yet still others are drawn with no mane at all (see Fig. 6). Similarly, differences in the manner in which horses' legs are drawn as part of the overall image can be observed (see Figs. 4 and 7). Particularly marked variation among scenes also occurs in the depiction of weaponry such as arrows and guns (Fig. 8). Such discrepancies are even more stark when it is observed that these stylistic differences between weapons occur not just as single examples, but often occur in groups of repeated stylistic similarities in several weapons, both in the case of firearms (e.g., Figs. 4 and 9) and arrows (Figs. 5 and 7). Accordingly, specific scenes seem to converge on stylistic commonalities and yet differ in others. In a set of scenes on the upper right portion of the robe, for instance, trident-style hands are used as part of the "capture" convention as well as on combatants (see Figs. 4 and 6), while on other parts of the robe the more realistic style of hands is more commonly used, among which subtle stylistic discrepancies can be observed (Fig. 10).

In sum, there are several features of this robe that combine to indicate it was the product of more than one warrior and possibly painted by a "committee" of artists working together. Documented examples of Blackfoot biographic tradition art painted by more than one author include Bear Chief's tipi (Wissler 1911; Brownstone 2005b)

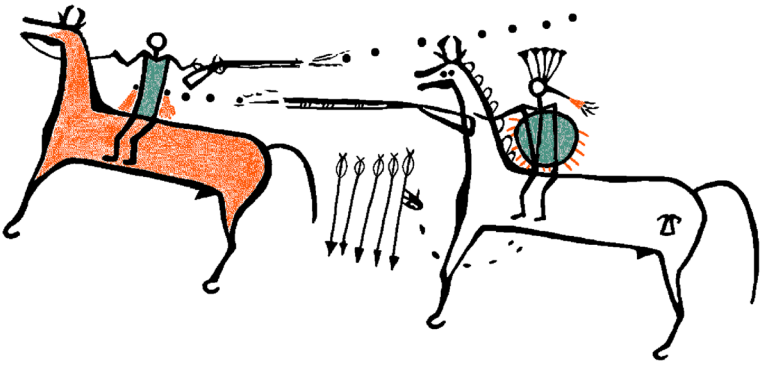

Fig. 7 Detail of interpersonal combat scene from the Malcolm robe involving two mounted warriors. The hero of the scene (shown right with shield) is shot at by an enemy who misses, as indicated by the flight of bullet depicted as a series of dots. Hero then shoots his enemy resulting in a through-and-through wound. After killing this enemy the hero then dismounts (footprints indicated) and takes arrows. Note the horse on right bears a "flying triangle" brand on its hindquarters. Vignette drawn by JDK from high-resolution photograph and assisted by tracings in Brownstone (2015) and King (2001)

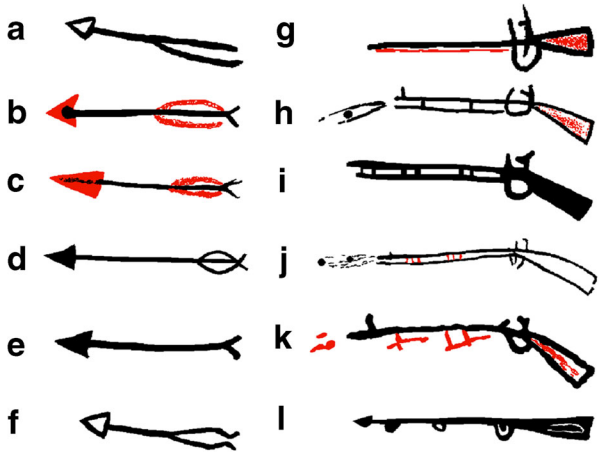

Fig. 8 Stylistic differences in the form arrows (**a**–**f**) and firearms (**g**–**l**) occurring in different scenes across the Malcolm robe

and the Four Chiefs' robe (Dempsey 2007; 100–107). We also know of other examples, such as Sharp's robe (Dempsey 2007: 71), which was painted by a single warrior (Sharp) but depicts the exploits of three warriors. The latter is demonstrative of instances of biographic art being produced by "committee" (see also Ewers 1939: 6).

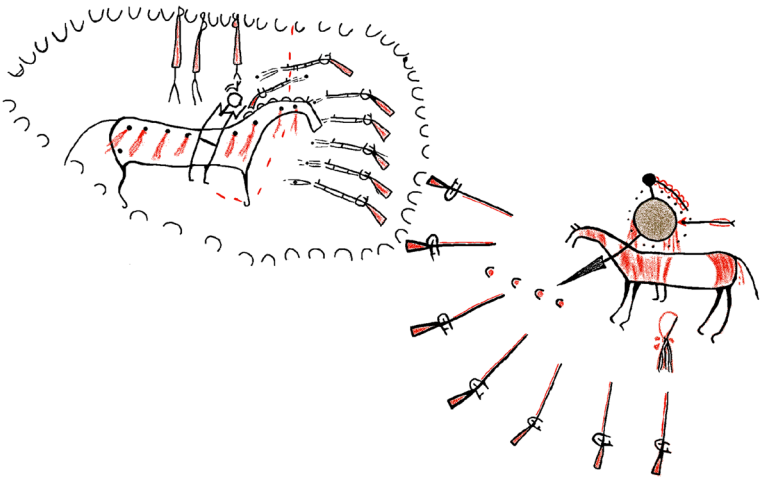

Fig. 9 Stylistic discrepancies in the form of weapons frequently occur in groups between scenes. While there are obvious differences in the firearms depicted on the left and right of these vignettes, note also that those on the left are shown with muzzle blasts while those on the right are not. This is despite the fact that the rifles on the right were fired, as indicated by the circle of bullets surrounding the mounted-warrior's shield, indicating that the artist was not simply implying the guns on the right were unfired. The mounted warrior on the left has legs depicted in front of the horse, while the legs of the mounted warrior on the right disappear behind his horse. Stylistic differences between these scenes also extend to the horses. The horse on the left has a closed nose, while that on the right has an open nose. The horse on the left is drawn with two legs, while that on the right has four. In the horse on the left, the legs are drawn as extensions of the lines that form the body, while in the horse on the right, separate lines append the legs to its body. The hooks forming the hooves of the horse on the left curve more acutely to the rear of the legs, while those on the right are more openly drawn curves. Vignette drawn by JDK from high-resolution photograph and assisted by tracings in Brownstone (2015) and King (2001)

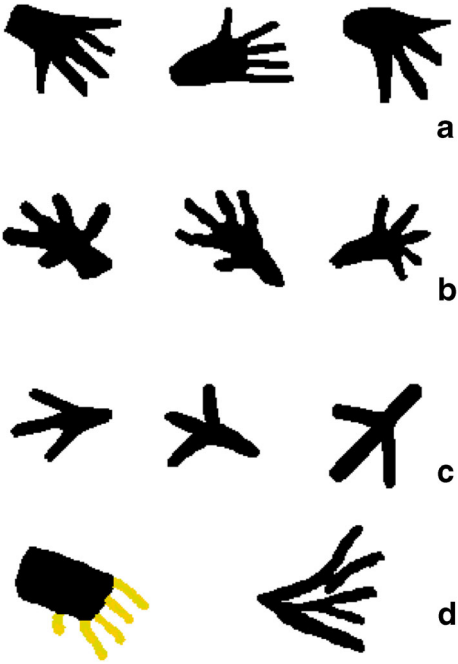

Fig. 10 Variation in the capture hand motif on the Malcolm robe. Row a, realistic hands with relatively realistic palm size (note that hand at right has only four fingers); row b, realistic hands with very narrow (or no) palm; row c, trident style capture hand; row d, unique examples, left is a bear paw style capture hand and right is a cluster of straight lines

Both the Four Chiefs' robe and Sharp's robe were commissioned as presentation pieces. This latter point is of potential note given that there has been some preliminary suggestion the robe may have been a presentation piece, with the robe making its way to the Malcolm family via Governor William MacTavish of the Hudson's Bay Company, who is understood to have received such a presentation piece during the nineteenth century (Brownstone 2014: 26).

Dating the Malcolm Robe: Seriations and Multivariate Statistical Analyses

Previous commentaries on the Malcolm robe have suggested that it may date to the early half of the nineteenth century based on its general stylistic qualities (Brownstone 2015: 15; King 2001: 73). However, to date, there has been no formal analysis of the robe that would provide more precise evidence of its chronology. Several points suggest, however, that such an evaluation would be particularly desirable in the case of the Malcolm robe.

For instance, while horses with "hooked" hooves (see Figs. 2, 4, 5, 6, and 7) are commonly depicted on early nineteenth century Blackfoot robes such as the Foureau robe and those collected by Maximilian, they also occur frequently in robes dating to the later Historic and reservation eras of Blackfoot art (Bouma and Keyser 2004; Brownstone 1993; Dempsey 2007). Accordingly, while the presence of hooked hooves

on the Malcolm robe is consistent with a date of pre-1850, in isolation, this is not definitive. Similarly, hourglass human forms appear in Blackfoot biographic art from at least 1833, but again are seen in examples continuing through to the early twentieth century (Dempsey 2007) and are actually often shown with greater frequency in robes after 1850 (Bouma and Keyser 2004).

One particularly notable feature of the Malcolm robe is that two (out of 13) of the horses displayed, clearly show the presence of brands on their hind quarters (see Figs. 6 and 7). Branding was not an activity undertaken by Native Americans on the Great Plains during the historic period (Ewers 1955: 329). Indeed, brands were clearly understood to be of European origin and were part of a suite of conventions used in biographic art to connote "war horse" by their authors (Petersen 1971: 292). One of the brands shown on the Malcolm robe (see Fig. 6) is of the "reverse C, C" style. This style of brand is unlike those used by the US cavalry, or indeed, the "corrupted" versions of such brands that are sometimes depicted in biographic art (McCleary 2016:126). Given that many horses on the Great Plains during the Historic period were derived from Spanish stock (Ewers 1955; Mitchell 2015), this brand may be of that origin rather than a EuroAmerican source. However, brands of similar style to this were used by ranchers in Arizona during the late nineteenth century (Anonymous 1898: 28) and in Wyoming during early the twentieth century (Anonymous 1913: 15). To add further confusion, brands conforming to this style are known from rock art at three sites in Montana (Fig. 11a-c), only one of which (Fig. 11c) convincingly dates to the reservation period. Ultimately, therefore, this brand offers little definitive evidence of chronology, nor even necessarily, the geographic origin of the horse.

The second horse brand shown on the Malcom robe consists of a triangle with two short curved lines protruding from its upper corner (see Fig. 7). McCleary (2008: 174-175) notes that a brand of this type was used in the late 1800s by the Ryan Brothers' Ranch situated between Roundup and Billings, Montana. However, similar, but not identical brands are also

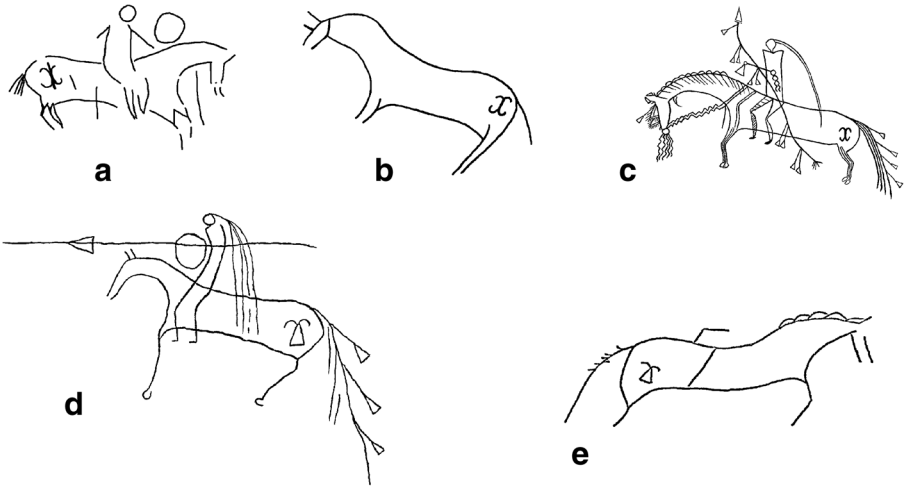

Fig. 11 Horses depicted at rock art sites in Montana and Wyoming bearing the "reverse C, C" brand and the "flying triangle" brand similar to those depicted on the Malcolm robe. **a** Castle Butte, Montana (**b**) H-H site, Montana; (**c**) Joliet, Montana (**d**) Bighorn Basin, Wyoming (**e**) 24YL589, Montana. Modified after: McCleary 2016: 51, 70; Keyser 1991: 263, 2010: 34, 39

known from ranches in Arizona during the first decade of the twentieth century (Anonymous 1900: 31; 1908: 212). Moreover, brand examples bearing a striking similarity to that shown on the Malcolm robe are known from two biographic rock art images in Wyoming and Montana (see Fig. 11d and e), neither of which again convincingly dates to the reservation period (Keyser 2010; McCleary 2016: 71). In short, neither brand on the Malcolm robe provides convincing chronological information and may be consistent with dates anywhere from the early nineteenth century through to the reservation period. However, given that brands of this type may have been in use well after the Malcolm robe's suspected early nineteenth-century date, this again stresses the importance of more detailed work on its chronology.

As we have shown, nearly every identified item and convention on the Malcolm robe—from the shapes of the humans to the portrayal of capture hands, a fortification, and medicine bundles—has a long history of use in Blackfoot biographic art. Given these considerations, we undertook a more formal set of analyses to assess the most likely date of production for the Malcolm robe, using specific motifs from a comparative dataset of Blackfoot robe art examples for which chronological information is available (Bouma and Keyser 2004). Previous analyses of the motif data from these robe art examples have demonstrated that they possess chronological structure (Bouma and Keyser 2004; Lycett 2017; Lycett and Keyser 2017). Here, we undertook a frequency seriation analysis of both human figure types and horse hoof types, an occurrence seriation analysis, and a multivariate statistical analysis (Principal Co-ordinates). The use of these different methods—which each differ slightly in the way they treat, display, and analyze the data—permits us to cross-check for points of consistency between them despite these methodological differences. We describe these analyses and their results in turn below.

Frequency Seriation

Frequency seriation operates on the basis that material culture attributes (e.g., artifact types, classes, motifs, and other attributes) vary through time in relative frequency and, accordingly, artifactual samples arranged according to such frequencies reflect chronological patterning (Deetz 1967; Dethlefsen and Deetz 1966; Lyman and Harpole 2002). Although frequency seriation has now been in use for over 100 years (Lyman and O'Brien 2006), this method continues to be of value in the analysis of rock art imagery (e.g., Keyser et al. 2012; Loendorf 1994). Bouma and Keyser (2004) demonstrated that, in the case of Blackfoot biographic robe art, the types of horse hooves and human figures used by artists seriate according to known chronological information, and these results have since been corroborated via alternative methods (Lycett 2017). We took advantage of this situation and undertook a frequency seriation analysis to better determine the likely chronological position of the Malcolm robe.

To undertake these analyses, we used a comparative dataset compiled from study of 23 known examples of Blackfoot biographic art (Table 1). These biographic examples include painted hides, war shirts, a tipi cover, and painted muslin panels, which, for convenience, can be described collectively as "robe art" (Keyser and Klassen 2001: 259). These data, which span almost a century from 1820 to 1915, were taken from Bouma and Keyser (2004). Because in some individual robe art cases insufficient detail was present to record the exact type of human or

Table 1 Examples of comparative Blackfoot painted robe art included in the analyses

Robe art example	Date
Black Boy	1915
Big Moon	1915
Wolf Carrier	1909
Running Rabbit	1909
Calf Child	1909
Four Chiefs	1909
Wissler Tipi	1903
Three Suns	1894
Many Shots	1894
Sharp	1892
Crop-eared Wolf	1882
ROM	1850–90
Merriam	1850–90
Hime	1858
Kane robe	1848
Kane Shirt	1848
Sweden	1843
Maximilian	1833
Bodmer	1833
Catlin	1831
Copenhagen	pre-1850
Foureau	pre-1850
Ellis	1820

horse hoof motif (Bouma and Keyser 2004: 16), or because an insufficient number of humans or horses were present in a given case, we undertook two separate frequency seriations—one for horse hooves and one for human figures. Accordingly, slightly different robe art samples were used in each case. Human figure types consisted of five stylistic categories (V-neck forms, hourglass forms, rectangular-bodied forms, realistic forms, and other), while horse hoof types consisted of three stylistic categories (hook/dot forms, triangular forms, and none). Human figures are represented a total of 64 times on the Malcolm robe, categorized as 43 V-neck forms, three rectangular forms, 11 hourglass forms, with seven figures classified as "other" because their bodies are obscured by shields or formed of cloth appliques. These figure counts for the Malcolm robe and all 23 comparative Blackfoot examples were converted to percentages to reflect *relative* frequencies across examples, as required for frequency seriation (Dethlefsen and Deetz 1966; Lyman and Harpole 2002).

Figure 12 shows the results of the frequency seriation for human figure types, while Fig. 13 shows the equivalent results for horse hoof types. Encouragingly, both frequency seriation analyses are consistent in indicating that the Malcolm robe was produced prior to 1850. Indeed, the frequency seriation of human figure types suggests a date of production around 1830 or shortly thereafter.

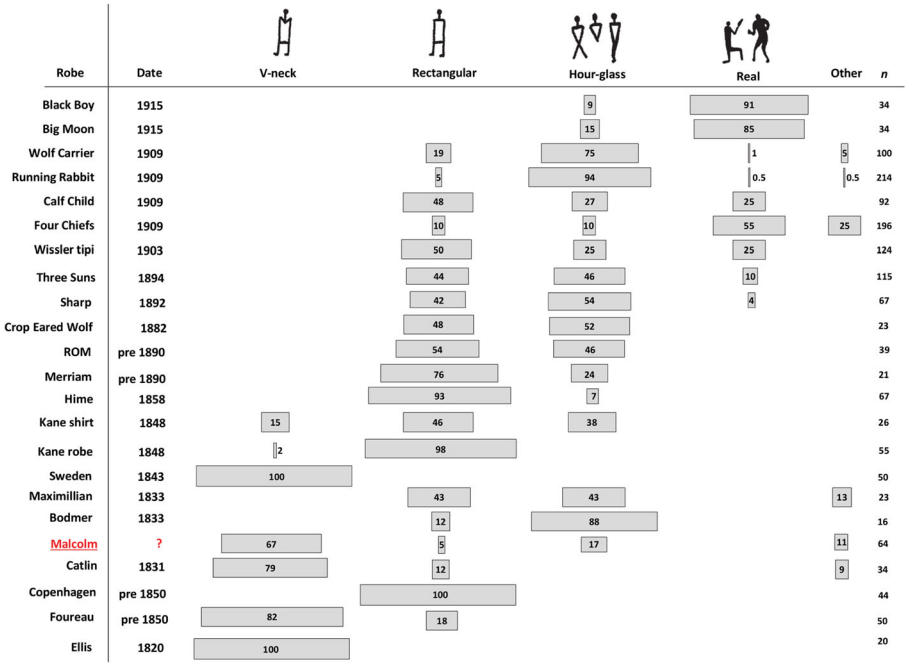

Fig. 12 Frequency seriation for human figure types. Frequencies (percentages shown in horizontal bars) represent the relative frequency of occurrence of each motif class. The position of the Malcolm robe is consistent with a date of around 1830

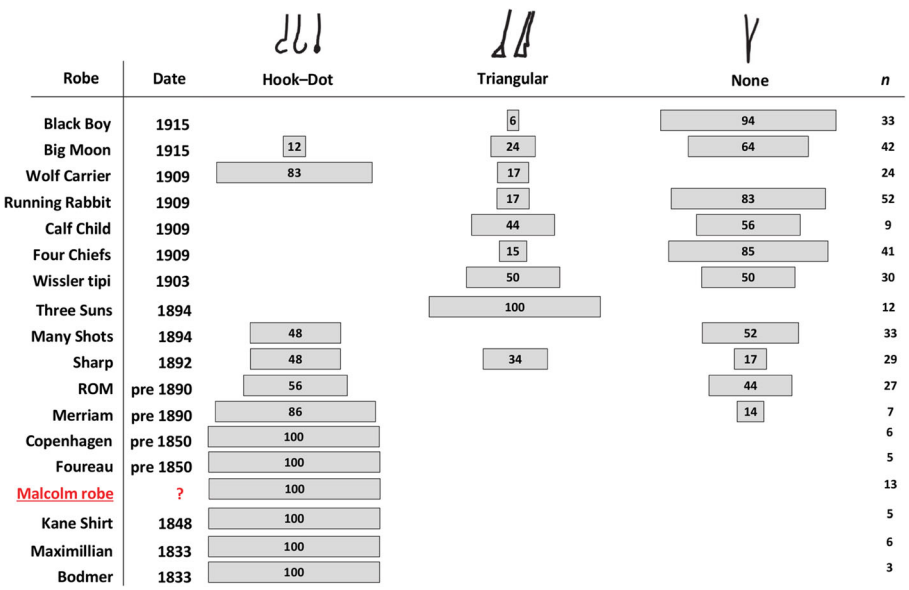

Fig. 13 Frequency seriation for horse hoof types. Frequencies (percentages shown in horizontal bars) represent the relative frequency of occurrence of each motif class. The position of the Malcolm robe is consistent with a date of production prior to 1850

Statistical Occurrence-Seriation Analysis

Although frequency seriation has been demonstrated to be an effective means of chronological ordering in specific circumstances (Deetz 1967; Dethlefsen and Deetz 1966), it obviously relies on the assumption that the frequencies seen in particular specimens are indeed representative of its chronological context. Unfortunately, several additional factors are known to potentially influence relative frequencies, such as external stylistic influences, sampling bias, or the individual preference of a particular artisan (Deetz and Dethlefsen 1965; Dempsey and Baumhoff 1963; Dunnell 1970; Rowe 1959). Frequencies may also be problematic in cases where motifs with low frequencies are among the most chronologically sensitive (Dempsey and Baumhoff 1963: 498). If one or more of these factors is present in a particular case, this could lead to items being anachronistically positioned in a frequency seriation. Moreover, as we have seen, the use of relative counts means that in cases where horse hooves or human figures are absent or present in insufficient numbers, this leads to a situation where separate frequency seriations involving a slightly different combination of specimens must be undertaken. In other words, the full array of comparative samples cannot be included in a single analysis. It is for these reasons that occurrence serration was introduced as an alternative method for chronological ordering (Dempsey and Baumhoff 1963; Rowe 1959). Occurrence seriation simply uses the presence and absence of a particular element (rather than its frequency) and permits the inclusion of items that do not contain sufficient numbers of cases for frequency analysis. Accordingly, unlike frequency seriation, this method allowed us to combine all 23 comparative robe art examples into a single seriation alongside the Malcolm robe. Moreover, this method also permitted the inclusion of six additional motifs, which although have been shown to have important chronological relevance (Bouma and Keyser 2004; Lycett 2017; Lycett and Keyser 2017), are present in insufficient numbers to be included in a frequency analysis. Occurrence seriation circumvents this issue.

Here, following Brower and Kile (1988), we used a quantitative algorithm for ordering specimens. The occurrence-seriation method described by Brower and Kile (1988) is specifically designed for presence–absence data. The method seriates the data such that—as far as the data allow—the presences are arranged along the diagonal, while absences are concentrated in the off-diagonal areas of the seriated matrix. A perfect seriation will thus have all presences arranged along the diagonal, with no presences located in off-diagonal areas of the final seriated sequence (Brower and Kile 1988: 80). Brower and Kile (1988) also describe a means of quantifying the extent to which the seriated data actually fit a diagonal arrangement or, alternatively, the extent to which the data deviate from a perfect (diagonal) arrangement. The index varies between 0 and 1, with a perfect seriation yielding a value of 1. The index measures the number of "embedded absences" (i.e., absences that occur within the range of presences for a given column), whereupon a relatively higher incidence of embedded absences generates a lower index value. Following Brower and Kile (1988: 80), this seriation index can be described by the formula:

$$1-\left[\frac{\sum_{j=1}^{n} A_j}{\sum_{j=1}^{n} R_j}\right],$$

where A_j is the number of embedded absences in a given column (j), R_j is the range of the presences in a given column, and n is the number of columns.

Two types of analysis are possible using this method (Brower and Kile 1988). In a "constrained analysis" where the dates of the items listed in rows are known, the rows remain constant and the columns are rearranged so that presences (as far as the data allow) are arranged along the diagonal. This analysis is, therefore, useful to determine (quantitatively) the extent to which the underlying presence–absence data fit the known temporal sequence of dated items. In this type of analysis it is also possible to statistically determine if the data are significantly different from random. This can be accomplished by simulating 30 random matrices with the same number of occurrences for each row, and comparing these to the original matrix using a Monte Carlo simulation procedure (Hammer 2016: 99), whereby $p < 0.05$ indicates that the data are significantly different from random. In the second ("unconstrained") type of analysis, both the rows and the columns are free to move and the data are simply seriated so the number of presences along the diagonal are maximized. No p-value is available for this second type of analysis.

Here, both types of analyses were utilized. We first ran a "constrained" seriation analysis using only the robe art data for which chronological information was available (i.e., the Malcolm robe was left out). The purposes of this analysis was to determine whether the underlying presence–absence data had statistically significant chronological signal using the procedures just described. If the data show a statistically significant chronological signal, this justifies their use as a means of dating the Malcolm robe in a subsequent "unconstrained" analysis, whereupon the seriation is re-performed including the Malcolm robe but using the unconstrained feature (i.e., since its chronological position is unknown it is free to "float" wherever the data best determine it should fit). All analyses were undertaken using the freely available program *PAST* v3.12 (Hammer 2016).

Figure 14 shows the results of the constrained seriation, minus the Malcolm robe. The analysis produced a seriation index of 0.68, which is statistically significant ($p < 0.0001$). Accordingly, this analysis demonstrates that underlying comparative motif data have statistically significant temporal signal, which justifies their use to help determine the likely chronological position of the Malcolm robe. Figure 15 shows the results of the unconstrained analysis, which includes the Malcolm robe data alongside the comparative examples. As shown in Fig. 15, this analysis again indicates that the Malcolm robe was produced before 1850, and the Malcolm robe most closely associates with the Catlin, Maximilian, and Bodmer examples in the seriation, all of which were produced in the early 1830s.

Principal Coordinates Analysis

We also applied a third type of analysis to the data to determine the probable age of the Malcolm robe using multivariate statistical comparisons (Principal Coordinates Analysis, or "PCo"). This method has previously been shown to yield important chronological signal for robe art data (Lycett 2017; Lycett and Keyser 2017). PCo provides a different means of handling the data and visualizing the results compared with our previous two methods. PCo again operates on the basis of presences

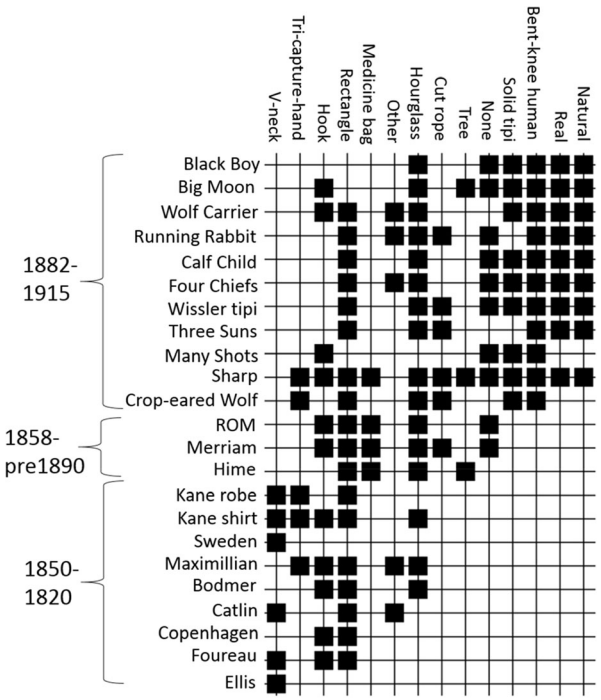

Fig. 14 Constrained occurrence-seriation analysis (without Malcolm robe) where character data are free to move but taxa are not. The analysis demonstrates that underlying character data have statistically significant temporal signal. Seriation index = 0.68, $p < 0.0001$

and absences rather than frequencies, but treats these data differently to occurrence seriation. One potential problem with occurrence seriation is that it treats ambiguous cases (e.g., where there was insufficient detail to correctly classify a particular motif) as a "hard" or definite "absence" rather than as an ambiguous or "missing" case. Conversely, PCo allows such ambiguous cases to be treated as "missing" and then permits the analysis to proceed in such a manner that the occurrence of these ambiguous cases is more explicitly taken into account. Despite these methodological differences, if the two methods produce comparable results, then this obviously strengthens conclusions drawn.

PCo analysis is a multivariate statistical procedure that operates on distance matrices (Davis 1986; Gower 2005). These distance matrices simply describe (quantitatively) the overall similarity and dissimilarity between all pairs of items analyzed, using a measure of "distance" computed from the input data. Particular measures of distance are appropriate in different cases, depending on the form of the data used (Shennan 1997). Here, we computed distances between robe art examples using the Jaccard distance measure. Jaccard measures are particularly suitable for presence–absence data, because they compute distance based on shared presences rather than absences, which helps diminish the influence of absences that may simply be the result of sampling error (Jordan and Shennan 2003; Shennan 1997). Moreover, the cases of missing (i.e., ambiguous) data were handled by application of pairwise deletion. This is a conservative means of handling missing cases, whereupon if a data point was coded as missing

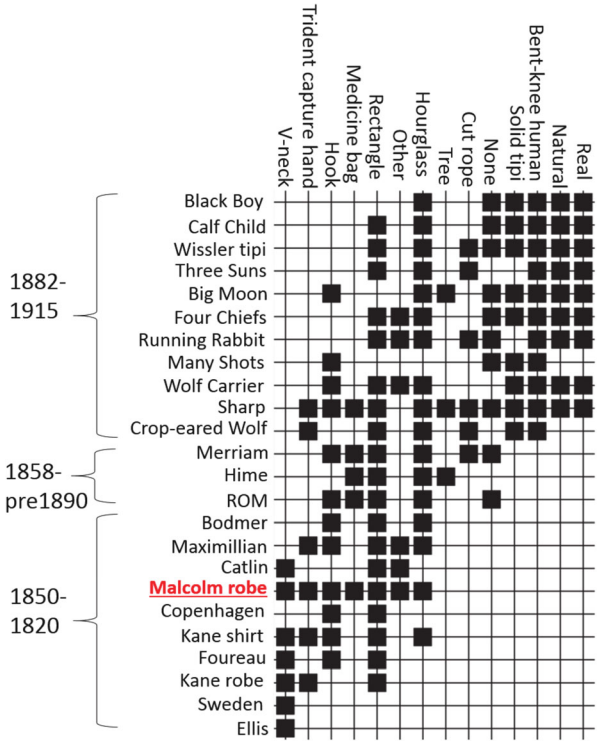

Fig. 15 Unconstrained occurrence-seriation analysis. In this analysis where both taxa and characters are free to move to maximize fit, position of Malcolm robe clearly indicates the robe was painted prior to 1850. In terms of character data, the Malcolm robe most is similar to the Maximilian, Catlin, and Bodmer robes, all dating from the early 1830s. No *p*-value is available for unconstrained analyses

for one of the variables in a pair of robe art specimens, that variable was excluded from calculation of the total "distance" between both those two items.

Following computation of the distance matrix, PCo analysis identifies and extracts eigenvalues (measures of variance) and eigenvectors ("coordinates") from the matrix, enabling the major patterns of variation between items listed in the matrix to be quantitatively described and illustrated visually as a scatter plot (Davis 1986; Gower 2005). Of the eigenvectors (i.e., coordinates) extracted, each coordinate subsequently explains less of the original variation between items in percentage terms. Here, we plotted the first two principal coordinates against each other, so as to facilitate a means of visualizing the major axes of variation between the robe art examples, and allow a visual assessment of the date of the Malcolm robe based on which robes it most closely clusters with in the plot. This analysis was undertaken using *PAST* v3.12 (Hammer 2016).

Figure 16a shows the results of the PCo analysis. The Malcolm robe is positioned within a group containing all of the robes dating to the first half of the nineteenth century (Fig. 16a). The strength of the chronological groupings displayed in Fig. 16a can be tested quantitatively by undertaking statistical analyses on the PCo scores. The PCo scores on the first principal coordinate are significantly different between robes dating from 1820 to 1850 and those dating after 1858 (Mann-Whitney $U = 0$; $n_1 = 10$, $n_2 = 14$; exact $p < 0.0001$). Indeed,

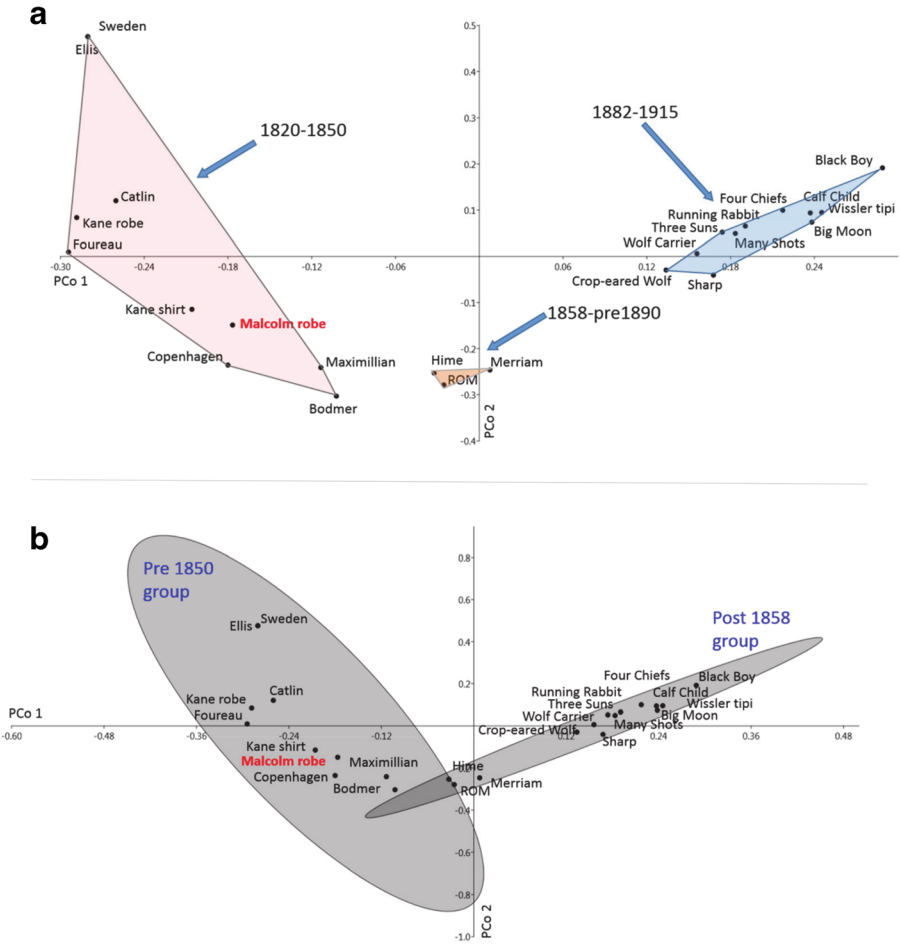

Fig. 16 Results of Principal Coordinates analysis. **a** Polygons indicate the chronological information for the comparative data. PCo method places the Malcolm robe in the pre-1850 group. PCo1 = 35.2% variation, PCo2 = 18.8% variation, all subsequent PCos each account for less than 10% of overall variation among robes. **b** 95% confidence ellipses for pre-1850 robes (left) and post-1858 robes (right). Malcolm robe is well within 95% ellipse for pre-1850 group (close to the center of ellipse for that group) and outside the 95% confidence limits for post-1858 group

scores from first principal coordinate are significantly different between robes dating from 1820 to 1850 and the small cluster of three robes that date between 1858 and before 1890 (Mann-Whitney $U = 0$; $n_1 = 10$, $n_2 = 3$; exact $p = 0.003$). Such results again attest to the strength of chronological signal in the underlying data, and help affirm statistically that the Malcolm robe predates 1850. A pre-1850 date is also confirmed by examination of the 95% confidence ellipses in the PCo analysis (Fig. 16b). The Malcolm robe is well within 95% ellipse for the pre-1850 group (close to the center of the 95% confidence ellipse for that group) and falls outside 95% confidence limits for the post-1858 group.

In sum, in congruence with the two previous methods, the PCo analysis strongly indicates the Malcolm robe was produced prior to 1850.

Discussion and Conclusions

Having first established that the Malcolm robe is of probable Blackfoot origin, based on comparison of content with equivalent examples of Biographic tradition art, it is possible to use examples of Blackfoot biographic art with known chronological information to help establish its date. We applied quantification of the Malcolm robe's stylistic details, alongside that of 23 comparative Blackfoot examples, and used these data in three separate analyses: frequency seriation, statistical-occurrence seriation, and multivariate statistical comparison. The use of these separate analyses is important because although they all differ slightly in the way they treat, analyze, and display the data, they permit the cross-verification of results despite these differences. All three of our analyses consistently indicated that the Malcolm robe was produced prior to 1850. Hence, it can now be more firmly established that this robe joins around nine other early nineteenth century examples of Blackfoot biographic robe art, which document individual actions undertaken by warriors during pre-reservation warfare on the northern Great Plains (Brownstone 1993, 2001; Bouma and Keyser 2004; Dempsey 2007). It also joins its correct position among a wider sequence of rock art examples from the northern Plains, as well as a much broader sequence of Biographic tradition artworks more generally (e.g., Fig. 1).

Several of our analyses highlighted comparability between the Malcolm robe and three robes first documented during the early 1830s. Accordingly, a more fine grained, but admittedly tentative reading of our analyses, would suggest that the Malcolm robe was produced around this time. Brownstone (2001) has previously noted certain stylistic similarities between the Malcolm robe and the Foureau robe, also dating from the early nineteenth century. The style and manner of composition of the human figures on this robe certainly support such comparison. However, our analysis also supports Brownstone's (2001: 262-263) further suggestion that this robe compares in overall style to the robe collected by Maximilian in 1833, and indeed the Bodmer robe documented the same year. Brownstone (2001: 263) specifically noted the presence of shield-bearing warriors on both the Malcolm and Maximilian robes. However, multiple points of stylistic comparison can be noted between the Malcolm paintings and those on Maximilian's robe (for illustrations see, e.g., Dempsey 2007, plate 1; Thomas and Ronnefeldt 1982: 17), including the use of single-legged (profile view) hourglass figures, the style of depiction of feathers on headdresses and shields, the style of headdresses, use of pinnate tails on horses, and looped/crenulated manes on horses, as well as general stylistic similarities of weaponry in both examples. In sum, several figures and scenes from the Malcolm robe and Maximilian robe could be switched with each other and not look stylistically out of place on either robe. While none of these individual features is exclusive to these two robes alone, their common occurrence on both robes helps support a suggestion that the Malcolm robe was produced around the same time as the Maximilian robe. Of further note, Brownstone (2001: 262) also mentions the similarity between the elongate form of hourglass humans depicted on the Malcolm robe and that shown on the second Blackfoot (Piegan) robe collected by Maximilian, also in 1833 (see Fig. 3). This distinctive variant of hourglass figure would add yet a further example of stylistic similarity between the Malcolm robe and those painted during the early 1830s. Hence, our analyses, and these further considerations, all point toward a conclusion that not only was the Malcolm robe painted prior to 1850, but that its most likely decade of authorship was during the 1830s.

Our analyses do, however, stress a methodological point that dating exercises of the type we undertake here should be multivariate in form. For instance, we have noted the presence of medicine-skin bundles on the Malcolm robe. However, if this feature alone had been used as a means of inferring the robe's chronology, then it may well have led to a conclusion that it post-dates 1850, since medicine bundles are more frequently documented in Blackfoot art during the second half of the nineteenth century (Bouma and Keyser 2004: 20). Our multivariate analyses (i.e., our occurrence seriation and principal coordinate analysis) both demonstrate statistically, however, that when this feature is included as a data point within the analysis, this does not invalidate a pre-1850 date when other data are taken into account. Likewise, the presence of brands on two of the horses might also have mistakenly led an observer to suggest a later date for the robe, particularly if explicit comparison were drawn between the form of those depicted on the Malcolm robe and similar examples which are documented to be have been in use in during the later nineteenth century and reservation period. In fact, our analysis demonstrates that both the "reverse C, C" and "flying triangle" brands shown on the Malcolm robe were brand forms that were in use during the early nineteenth century. Further investigation of brand styles, especially those documented in Spanish sources, may provide a valuable source of information on these and other brands recorded in nineteenth century biographic art (see e.g., Keyser 2010). However, for the time being, our analysis shows that caution should be exercised in assuming that an item of Plains biographic art dates to the late nineteenth century on the basis of a horse brand, even if that brand is similar in form to later documented examples.

Importantly, our analysis more firmly connects the Malcolm robe—which it must be remembered is a document of real events that took place in people's lives—to its wider historical context. There is a rich historical record relating to the fur trade on the northern Plains (Ray 1974; Wishart 1979; Wood and Thiessen 1985) to which the Blackfoot are increasingly connected after 1830 due to a switch in European demand from beaver pelts to bison hides (Lewis 1942: 29). At this time both Fort Piegan and, subsequently Fort Mckenzie, were both established in Blackfoot territory (Wishart 1979: 59). Accordingly, the Malcolm robe connects real events recorded by Blackfoot warriors at a date prior to 1850, to a point in history when the fur trade was having an increased effect on the lives and social organization of these peoples (Lewis 1942; Wishart 1979: 61–62). There are two historical records that relate to this time period: one written by Europeans in relation to the fur trade, the other written in the form of Biographic tradition art by indigenous peoples (Brownstone 1993, 2015; Keyser 2000, 2004; Dempsey 2007). Oral history was not the only form of historical recording undertaken by indigenous peoples on the Great Plains, and there is great potential for exploration in terms of integration between these Euro-American and Native-American histories (Gallo and Wood 2015). Moreover, as part of the Biographic tradition that can be reliably dated prior to 1850, the Malcolm robe can rightly be considered an important element within a 200-year-plus historical record from a key phase of this region.

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