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Michele Buzon
Purdue University

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Nubian identity in the Bronze Age

Patterns of cultural and biological variation

Michele R. Buzon

Department of Anthropology, Purdue University,
700 W. State Street, West Lafayette IN 47907, USA
email: mbuzon@purdue.edu

Abstract: *This study uses a bioarchaeological approach to examine the cultural and biological relationships between two groups who lived in ancient Nubia during the Bronze Age, C-Group and Kerma. While archaeological evidence indicates that these groups show many cultural similarities, reflections of behaviors such as pottery use and mortuary practices suggest that C-Group and Kerma displayed their ethnic differences in specific situations within a multi-ethnic context. Biological affinities assessed using cranial measurements suggest a common ancestry with few shape differences between the populations. Overall, the Kerma crania are larger than the C-Group crania, which could be accounted for by environmental and/or social variation. With the combination of data used in this research, a more nuanced understanding of these two contemporaneous Nubian populations is achieved.*

Key words: Nile Valley; Kerma; C-Group; Sudan; cranial measurements; biodistance; ethnicity; mortuary practices

Introduction

In the Nile Valley, the examination of ancient peoples has generally focused on the similarities and differences between Egyptians and Nubians, both culturally and biologically, as well as on changes over time (e.g., Berry & Berry 1972; Buzon 2006a; Carlson & Van Gerven 1979; Edwards 2004; Geus 1991; Godde 2009; Irish 2005; Smith 2003; Williams 1991). Fewer studies have focused on the biological and cultural affinities between contemporaneous groups in the region. During the Bronze Age (~3100–1100 BC) several different populations lived in Nubia. In this article, the archaeological evidence (such as burial ritual and pottery styles) used to define the cultures known as C-Group in Lower Nubia (northern region) and Kerma in Upper Nubia (southern region, **Figure 1**) is surveyed in conjunction with cranial measurements to examine the complex relationship between two groups who lived during this period in ancient Nubia. While both were situated in ancient Nubia during the Bronze Age, how closely were they related? The goal of this study is to investigate the cultural and biological variability in these two Bronze Age Nubian groups, to assess the evidence for group distinction, and to explore the relationship between cultural and biological variables in their ethnic group composition.

The people who lived in the middle Nile region of modern-day southern Egypt and northern Sudan are often collectively referred to as ‘Nubians’, a name that originated in medieval times. To Nubian archaeologists during the early 1900’s, the C-Group was much better

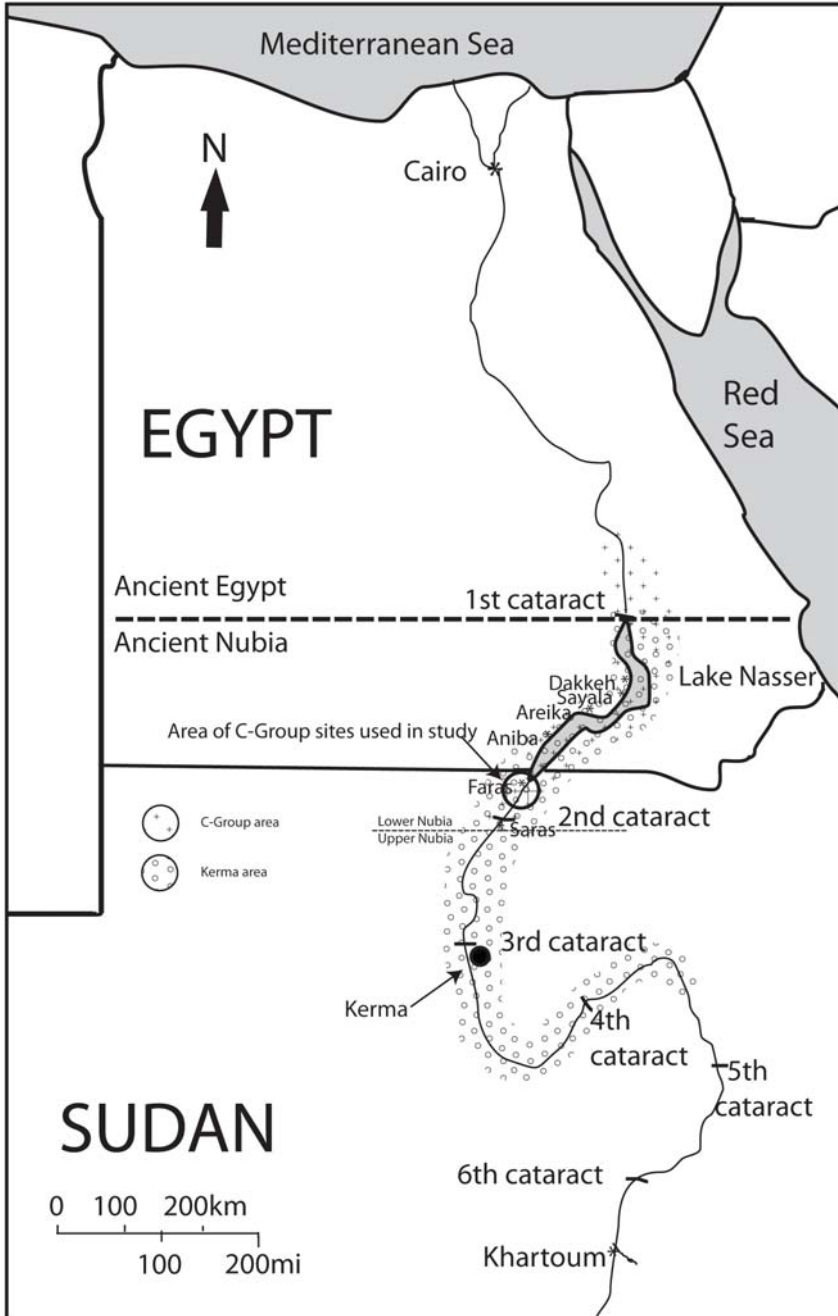


Figure 1. Map showing location of Kerma and C-Group areas and sites used in the study.

known and was thought of as a discrete bounded regional culture exclusive to Lower Nubia (Edwards 2004). However, fieldwork in Upper Nubia during the last 20–30 years is transforming our knowledge of the Bronze Age and is providing a more evenhanded understanding of both Lower and Upper Nubia during this period, with the interpretations of archaeological similarities and differences between Bronze Age C-Group and Kerma debated by various researchers (Bietak 1968; Bonnet 1992; Edwards 2004; Reisner 1923a; Williams 1983).

While long-term biological continuity from the Neolithic through Christian times (-3400 BC – AD 1500) has been demonstrated for Lower Nubian groups using dental non-metric traits, cranial non-metric traits, and cranial measurements (e.g., Berry & Berry 1972; Carlson & Van Gerven 1979; Johnson & Lovell 1995; Mukerjee et al. 1955; Prowse & Lovell 1995), the biological relationship between populations living in Lower and Upper Nubia is less certain. Irish (2005) has examined C-Group and Kerma populations using dental non-metric traits, finding statistically significant differences between the groups. Additionally, in contrast with the studies cited above, Irish (2005) found statistically significant differences between A-Group and C-Group in Lower Nubia. In his study, A-Group shares many dental non-metric trait frequencies with the Kerma sample, suggesting an ancestral relationship (Irish 2005). A more dynamic view of Nubian history and culture is offered by this reassessment of these Bronze Age Nubian groups.

Nubia and Nubian

Today, 'Nubia' is generally used to refer to the area (both in the past and present) in Northeast Africa where Nubian languages are currently spoken (Shinnie 1996), the region from just north of the 1st Cataract of the Nile in Egypt to south of the 3rd Cataract in Sudan. However, recent archaeological research has located Nubian sites associated with the Kerma culture in the 4th and 5th Cataract areas as well (Smith & Herbst 2008; Welsby 2007). Some researchers use 'Nubia' simply as a geographic name, rather than as an indication of ethnicity or language (Bianchi 2004; Edwards 2004; O'Connor 1993). Although people have lived in this region as far back as 13,000 BC, the word 'Nubian' in reference to an area's name does not appear until the 3rd century BC (O'Connor 1993 citing Wenig 1980). In Christian times (AD 540–1500), inhabitants of the region spoke Nubian languages, though it is thought that the language can be traced back as far as the Egyptian Middle Kingdom (2050–1650 BC; Behrens 1981; O'Connor 1993; Rilly 2007).

The etymology of the word 'Nubia' is disputed (O'Connor 1993). Popular opinion links it to the ancient Egyptian noun, '*nebu*', meaning gold (Bianchi 2004), given that Nubia was the source for gold in ancient Egypt (Adams 1977). Bronze Age Egyptians called Nubians, *Nehasyu*, referring to the nomads of the region, riverine peoples, and those living by the Red Sea Coast (O'Connor 1993). It is also proposed that the term derives from a Nuba Hills word for slave (Thewall & Schadeberg 1983). Although it was originally suggested that the place, Yam, in Egyptian texts referred to Nubia, archaeologists have recently discovered an inscription that locates it further west (Clayton et al. 2008). Beginning in the Middle Kingdom, Egyptian texts call this area Kush, although the term was originally applied to Upper Nubia only. By the 1st millennium BC, Kush was the preferred name for all of Nubia in Egyptian, Assyrian, Persian, and Hebrew languages (O'Connor 1993).

Biased perspectives on Nile Valley populations

Scholars traditionally viewed Nubia from an Egyptian viewpoint wherein Nubia is eclipsed by the well-known history of Egypt and is seen as marginal and controlled by Egypt, a perspective that underestimates Nubia as an active player in regional politics (Adams 1977; Hafsaas-Tsakos 2009; Smith 2003). The portrayal of ancient Nubians by contemporary Egyptians in texts and artistic representations supported these ideas; Nubians were often depicted as simple people living in modestly built villages (O'Connor 1993). When Nubian archaeological sites began to be excavated in the late 19th and early 20th centuries, many of the initial interpretations were colored by racist views common during that time (Bernal 1987). Reisner (1923a) originally attributed the grand architecture and material remains uncovered at Kerma, as well as at A-Group sites, to Egyptians (Török 2009), hypothesizing that local 'black' culture could not have been responsible for the scale and grandeur of the habitation sites, *deffufas* (large mud brick buildings) and tumulus cemeteries. He suggested that the buildings were actually Egyptian trading posts and forts, the headquarters of Egyptian governors who were buried in the cemeteries. Questioned by several researchers (e.g., Batrawi 1946; Hintze 1964; Junker 1921), the Kerma remains were eventually recognized to be entirely Nubian (except for some traded statues). However, the common view of Egyptians as the 'civilizers' of Nubians was also maintained in anatomical research (e.g., Smith & Derry 1910a, 1910b), which linked cultural change with the influx of new peoples and claimed population replacement as well as cultural decline caused by the influence of the 'negroid' element. These studies, along with many sources during this period that asserted that Egyptians were white, used primitive and highly subjective methods often relying on selective observations, and found material confirmation of whatever historical theories they wished to believe (Adams 1977; Carlson & Van Gerven 1979; Diop 1981). Shared by nearly all early students of Nubian history, these biased ideas drastically affected Egyptological views of Nubia (Sherif 1981) and survived long after the destruction of their empirical foundation (Adams 1977).

Bioarchaeological approach to identity

In this article, the study of identity is approached from a multidimensional perspective that considers both the physical and social body through the inclusion of ethnicity, cultural practices, and biological relationships (Bentley 1987; Buikstra & Scott 2009; Goldstein 2006; In-soll 2007; Knudson & Stojanowski 2008; Sofaer 2006; Zakrzewski 2011). The combination of biological data analyses with an exploration of ethnicity can offer valuable contributions to our understanding and reconstruction of group dynamics and differentiation in the past (e.g., Buzon 2006a; Stojanowski 2010; Sutter 2005; Torres-Rouff 2008). For this study, the definition of terms as put forth by Jones (1997) is used: an ethnic group sets itself apart and/or is set apart by others based on the perceived cultural differentiation and/or common descent; ethnic identity is the aspect of a person's self-conceptualization resulting from identification with a broader group in opposition to others. Cultural models classify individuals or groups based on observable variations and are understood to be important in social relations in a particular environment (Jones 1997).

When reconstructing the composition and formation of ethnic groups (i.e., ethnogenesis), we should consider the various systems that are related to population history, including bio-

logical variation, culture, and language (Sapir 1949; see Ortman 2010 for an excellent use of this idea). It is imperative, however, to keep in mind that these systems need not co-vary. Distinct ethnic groups have been found at times to be genetically similar (Arnaiz-Villena et al. 2001; Tartaglia et al. 1996). Each ethnic group is a product of their particular context and genetic history. The examination of the various factors that play a role in ethnic identity provides a way to more deeply understand the undercurrents of ethnogenesis.

The extent to which common ancestry plays a role in the creation and maintenance of ethnic groups is debated, as is the relationship of ethnic groups to real, perceived, or culturally constructed descent (Barth 1969; Emberling 1997; Jones 1997; Keyes 1976; Van den Berghe 1978). Nonetheless, the biological evolutionary history of a group can influence the perception of their ethnic identity in relation to others. Ethnicity is recognized to be fluid and can be determined by both outsiders and group members based on apparent differences and similarities (Barth 1969; Jones 1997). Researchers have criticized linking group ethnic or cultural identities with artifacts, while acknowledging that material culture can be active in creating and maintaining ethnic distinctions (e.g., Hodder 1982; Shennan 1994). Rather than using an archaeological trait-list approach, a careful contextual approach can uncover evidence to reconstruct ancient ethnic dynamics (e.g., Emberling 1997; Hodder 1982; Jones 1997; Kamp & Yoffee 1980; McGuire 1982; Meskell 1994; Santley et al. 1987; Smith 2003, in press). This integrative approach involves understanding how objects were used, which may be more important than the object itself (Smith 2003). Evidence of particular behaviors rather than, for example, design similarities, is critical to understanding the cultural dynamics of the past (Kamp & Yoffee 1980). Additionally, it is useful to examine evidence for ethnic group affiliation in various categories of material remains such as meaning-laden religious and funerary architecture (Santley et al. 1987).

Cultural affinities

Materials and methods

Despite the high number of identified sites and large scale excavations that took place during the 1950's to 1970's with the help of UNESCO (more than 1000 sites with about 1/3 excavated, Török 2009), much of the archaeological work in Nubia has concentrated on the more artistic and imperial monuments including temples, palaces, and tombs (Adams 1977; O'Connor 1993). As a result, the archaeological indications of identity that are used in this study primarily come from mortuary contexts due to the overall lack of excavated and analyzed habitation sites in Nubia (O'Connor 1993). Burial practices have been suggested to be a key area of ethnic expression as they manifest the primordial bonds linked to the construction of ethnic identity (DeCorse 1999; Emberling 1997; Hall 1997; Santley et al. 1987). It is important to remember that burial practice may allow for the renegotiation of identity, rather than the replication of a person's identity during life (Hodder 1982). Public monuments and tombs are highly visible statements and may be used to send a message about one's identity to outsiders as well as to the local community (Blake 1999; Smith 2003). In addition to information on mortuary practices and associated pottery, this study makes use of archaeological evidence for C-Group and Kerma subsistence, and settlement and economy, where available.

Nubian identity in the archaeological record

Tracing back the origins of the groups in this study, evidence of regional human occupation appears in the area of the 3rd Cataract in Upper Nubia near Kerma during the Late Neolithic, a period referred to as Pre-Kerma (**Table 1**). The settlements are eroded and rather ephemeral but the number of sites suggests an intensive occupation of the region. In Lower Nubia, many cemeteries and a few settlements dating to this period have been found and are associated with the culture called A-Group in the northern region and Abkan in the southern (Török 2009). George Reisner gave the A-Group designation (as well as the C-Group name) because the original name of the group was unknown (Edwards 2004; Haynes 1992; Reisner 1909, 1910). Török (2009) considers the A-Group a complex chiefdom. Originally seen as a distinct Nubian culture, similarities in material culture between the A-Group and inhabitants of the Kerma region of Upper Nubia became apparent as work in the region continued. The Pre-Kerma culture developed into what we now call the Kerma culture, existing from about 2400–1500 BC or later. All traces of the A-Group in Lower Nubia ended with Egyptian aggression around 2900 BC, which forced them into areas east and/or west of the Nile Valley (Morkot 2000). It has traditionally been thought that Lower Nubia was resettled after several hundred years of the Nubian hiatus around 2400 BC by the C-Group, though more recent excavations suggest this could have been possibly a century earlier ~2500 BC (Seidlmayer 1991; Raue 2002).

Table 1. Chronology^a (after O'Connor 1993).

Date BC	Lower Nubia	Upper Nubia	Egypt
3500–3100	Classical A-Group	Pre-Kerma	Predynastic
3100–2900	Terminal A-Group	Pre-Kerma	Predynastic
2900–2400	(hiatus/uncertain)	Pre-Kerma	Early Dynastic/Old Kingdom
2400–2050	C-Group IA, IB	Early Kerma	Old Kingdom/First Intermediate Period
2050–1700	C-Group IIA, IIB	Middle Kerma	Middle Kingdom
1700–1550	C-Group III	Classic Kerma	Second Intermediate Period

^aB-Group, originally named by Reisner, is no longer considered to be a valid distinction (reinterpreted as poor and robbed A-Group graves, Morkot 2000).

Initial studies suggested that the C-Group consisted of foreigners who immigrated into the region (Reisner 1909, 1910; Smith 1908, 1909a, 1909b; Smith & Derry 1910a, 1910b). Later research (O'Connor 1993; Török 2009) has suggested that while most of the A-Group left the region around 2900 BC, some continued to live in the 2nd Cataract area and others settled in the eastern Sahara, Upper Egypt, and/or Upper Nubia where the eventual C-Group coexisted with the Kerma culture. Subsequently, it is thought that the C-Group began to resettle Lower Nubia; the C-Group element remains visible for a while in Upper Nubia, though most traces fade away by ~2000 BC (Edwards 2004; O'Connor 1993). Despite the early suggestion that C-Group represented foreign migrants in Lower Nubia (Adams 1967), their burials share some features with the earlier A-Group—especially burial position. Shinnie (1996) suggests that apparent changes from A-Group to C-Group were due to normal development during the passing of time. C-Group burials were larger and more elaborate than A-Group burials,

and pottery styles are similar but include a larger diversity of types. Adams (1977) maintains that the cultural connection between A-Group and C-Group can hardly be questioned. Williams (1983), however, notes considerable differences in the burial customs including the deposition of pottery outside the C-Group tombs and the general lack of superstructure in A-Group tombs, information that suggests distinct origins.

Clearly, Nubia was not a monolithic society during this time; there is evidence for contact between Egypt and several different chieftains in the area who ruled separate domains and sometimes fought against each other (Bianchi 2004; Török 2009). Groups were living in the eastern and western (Sahara) deserts, as well as further up the Nile River (Sherif 1981). Beginning around the 2nd millennium BC, a group referred to as Pan-Grave (named for the shallow, oval configuration of their graves) spread over a wide area in Egypt and Lower Nubia (Bianchi 2004; Edwards 2004; Török 2009). The Pan-Grave burials are associated with the Medjay nomads from the eastern desert who ranged back and forth between the Red Sea coastal plain and the semi-desert hills and plains (Bietak 1987), though the relatively small amount of archaeological work in the eastern desert limits our knowledge (Morkot 2000). They are known for their military skills and served as soldiers and police for Egypt (O'Connor 1993; Shinnie 1996). Trigger (1976) suggests that the Pan-Grave who settled in Lower Nubia may have been part of an Egyptian occupation force stationed to keep watch over the Nubians. Although Pan-Grave/Medjay skeletal remains are not abundant, some studies have demonstrated physical differences with C-Group samples (e.g., Strouhal & Jungwirth 1984). These various groups in the Nile Valley region from Lower Egypt and Upper Nubia as well as the desert areas had likely been interacting through trade and military relations since the Neolithic (O'Connor 1993; Török 2009).

Subsistence, settlements, and economy

The C-Group practiced the domestication of animals, cereal agriculture, and flood irrigation (O'Connor 1993; Säve-Söderbergh 1989; Williams 1983). Early C-Group settlements (~2200–1950 BC) at Aniba and Sayala are represented by post holes indicative of tent structures and circular structures of stones, respectively, indicative of temporary housing (Bietak 1966; Steindorff 1935). Later settlements (~1950–1600 BC), based on remains from the sites of Aniba and Areika, appear to have included more substantial mud brick structures in addition to a massive stone masonry defensive wall, a large granary, residential units, storage bins, flour mills, a bakery, a brewery, hearths, and a large courtyard where animals may have been held. Each region was likely governed by a *heka*, or ruler, presumably organized politically into something like a chiefdom, which developed over time. Egyptian sources indicate that rulers existed in Lower Nubia but it has been difficult to identify rulers' tombs in cemeteries (O'Connor 1993; Trigger 1976). While the temporary campsites seemingly appear to represent a more egalitarian society, social stratification is reflected in the mortuary evidence, which is corroborated by Egyptian textual sources (Török 2009).

The ancient town of Kerma is named for the nearby modern village (Haynes 1992; Kendall 1997). Kerma is viewed as a cultural and political center that developed in a relatively densely settled riverine area (Edwards 2004). Kerma's inhabitants practiced cereal agriculture, animal husbandry, flood and basin irrigation, and produced surplus that supported the elite. Animal resources were used for food sources as well as material for clothing and other personal adorn-

ment. The town of Kerma was comprised of mud brick houses, cult buildings, monumental brick temples, a large royal palace, and massive fortifications. Most of the city's population lived outside the defensive walls (Bonnet 1992; Gratién 1978).

It is unclear if Kerma could be considered a 'state.' Egyptian texts refer to Upper Nubia as if it were a single political entity called Kush. Pharaohs Senwosret I (1965–1920 BC) and Senwosret III (1874–1855 BC) fortified the 2nd Cataract area in Lower Nubia on a scale suggesting that Egypt feared large-scale attack or invasion from Kush as well as made frequent mention of the Nubians in texts, implying that Kerma was indeed a strong, well-structured polity capable of threatening Egypt (O'Connor 1993).

Mortuary practices and pottery

C-Group tombs are usually a relatively small pit meant for one body with a circular superstructure mound made of sand and gravel. Most graves are approximately two meters in diameter but grow in size over time. Cattle, sheep, and goat heads were occasionally placed outside tomb superstructures. Though rare, some C-Group tombs contain militaristic goods (O'Connor 1993). At Aniba, survey of the plundered tombs suggests that tomb superstructures varied in size and became larger through the C-Group phases. The larger tombs are clustered together on the periphery. Some of the large tombs have superstructures that have diameters in excess of sixteen meters (Säve-Söderbergh 1989).

C-Group pottery is characterized by red-burnished ceramic wares with blackened mouths or tops. The designs are complex and cover most of the surface. Coarse brown and red wares are also common. They are generally unburnished and in jar form with loosely organized designs on the upper part of the body. Over time the designs become more complex and spread out over more of the surface (O'Connor 1993; Säve-Söderbergh 1989; Williams 1983).

Kerma burial pits are small early on but expand in size during the Middle and Classic periods when the main burial is laid on a bed accompanied by several other humans and animals. Circular superstructures are low sand and gravel mounds reinforced by rings of small stone slabs or heavy pebbles. Early mounds are just over a meter in diameter and elite mounds become quite large. Animal heads and entire carcasses were placed as funerary gifts. Militaristic artifacts were included in some Kerma burials, such as archery items, bronze daggers, and short bronze swords (Reisner 1923a, 1923b). Kerma's cemetery with more than 20,000 tombs was in use for over 1000 years and includes unusually large tombs. The Classic Kerma period ruler graves were surrounded by elite burials as well as by community members, servants, and guards who appeared to have been sacrificed (Edwards 2004). Rulers were laid on gold-covered beds surrounded by treasures of gold, ivory, and jewelry along with a herd of cattle outside of the tomb (Haynes 1992).

Kerma pottery types include red-polished ceramic wares with blackened mouths or tops. Kerma pottery designs were often minimal and restricted to a band around the upper body. Kerma coarse red and brown wares were usually bowls, polished with bold, coarse, and simply incised designs. Jars often had a band of more neatly designed incisions around the shoulder (O'Connor 1993). However, during the Classic phase Kerma had a distinctive set of out-flaring beakers exclusive to their culture. These tulip beakers are very distinctive and are considered the archetypal form of Kerma pottery, perhaps made specifically for the burial context

as a marker of identity (Edwards 2004). These luxury wares had extremely thin walls, sharp rims, a glossy jet black interior, and a deep red exterior (Adams 1977).

Biological relationships

Methods and materials

Early anatomical works in the 19th and 20th centuries focused on the hierarchical classification of racial types (Trigger 1989). These approaches often conflated biology and culture with a racial model, though they were not uncontested (Boas 1912). In contrast with typological craniometry (Stojanowski 2010), cranial measurements are used in this study as a means of characterizing biological variation in the Kerma and C-Group and exploring the relationship between biological and cultural indicators of group affiliation. While these types of studies (biodistance) have been critiqued for reinforcing typology (Armélagos & Van Gerven 2003), similar to other researchers (see Stojanowski 2010; Stojanowski & Buikstra 2004), such kinds of data can be used to examine biological variation in relation to cultural processes on a small-scale regional perspective.

Researchers have used various types of biological data to investigate relationships between individuals and groups such as qualitative dental and cranial non-metric traits (quasi-continuous minor morphological variants of anatomy), quantitative dental and cranial metric traits (continuous linear measurements), and ancient DNA. Relethford and Lees (1982) assert that cranial measurements are more useful than other types of data in investigations of human population history as they are less prone to genetic drift. The use of craniometrics, however, is not without its criticisms.

Beginning with Boas' (1912) findings that the cranial shape of European-born immigrants and their American-born children differed, many researchers have recognized the effect that environment can have during growth and development. However, a recent reevaluation of Boas' data (Sparks and Jantz 2002) demonstrates that the discrepancy between the cranial shape of parents and children in Boas' study is negligible in comparison to the divergence between groups originating from different areas. Despite these findings, it is important to recognize the selective forces that may influence cranial shape. For instance, studies in Nubia (e.g., Carlson & Van Gerven 1979) have indicated that craniofacial shape changes accompanied the transition from hunting and gathering to agriculture. With temporal and spatial controls, however, it is reasonable to assume that selection should play an insignificant role in populations living in a single environmental zone with similar subsistence strategies (Carlson & Van Gerven 1979; Larsen 1997; Manica et al. 2007; Ortman 2010). In fact, some researchers suggest that the masticatory-induced stress on the cranium does not confound phylogenetic data (Collard & Wood 2001; von Cramon-Taubadel 2009). It is important to note that various regions of the cranium (such as the vault) appear to be more genetically congruent than other areas (such as the orbit, Hubbe et al. 2009; von Cramon-Taubadel 2011). Additionally, antemortem cranial modification and postmortem changes to the cranial shape must also be kept in mind when using this method to evaluate biological affinities.

Sex was determined for all of the material used in this study using features of the pelvis, when available (Buikstra & Ubelaker 1994:16-19). Cranial features were used for sexing if

pelvic remains were absent (Buikstra & Ubelaker 1994:20). Twelve cranial measurements (Buikstra & Ubelaker 1994; Keita 1988) were collected (**Table 2**) on the skeletal samples by the author using digital sliding and spreading calipers. The measurements were chosen based on standard usage in studies in the region. Because of sample preservation, not every measurement could be recorded on every cranium (see sample sizes in **Table 2**). Intraobserver error was tested by re-measuring 20% of the crania (T-tests confirmed a very low level of error, $p > 0.05$). T-tests of individual measurements were used to examine morphological differences between the C-Group and Kerma sample measurements. Because t-tests have been shown to exaggerate the effect of size (Hardy & Van Gerven 1976), multivariate techniques were also used to analyze the data.

Table 2. Cranial measurements used in this study.

Measurement		Females			Males		
		Mean	n	SD	Mean	n	SD
Nasal height	C-Group	47.2	37	2.7	49.3	22	2.8
	Kerma	46.0	115	3.0	48.3	72	3.2
Upper facial height	C-Group	66.8	37	4.7	68.7	22	3.1
	Kerma	65.9	115	4.0	68.8	72	4.8
Nasal breadth	C-Group	24.4	39	1.6	25.5	22	2.0
	Kerma	24.9	111	1.9	25.8	72	1.8
Bimaxillary breadth	C-Group	91.1	40	5.0	96.5	19	7.9
	Kerma	92.0	112	4.7	95.4	67	4.8
Bizygomatic breadth	C-Group	120.5	10	6.4	131.8	10	5.2
	Kerma	120.0	86	13.9	129.4	60	5.8
Cheek height	C-Group	40.7	41	3.3	43.6	24	3.1
	Kerma	41.0	132	3.7	43.7	82	3.8
Minimum frontal breadth	C-Group	90.4	64	4.2	94.7	40	4.3
	Kerma	90.4	160	3.9	93.5	102	4.4
Basion-bregma height	C-Group	131.3	28	5.6	136.4	20	5.4
	Kerma	130.4	119	5.0	135.6	78	4.9
Maximum cranial breadth	C-Group	129.4	41	5.6	135.3	28	6.2
	Kerma	131.4	154	5.0	134.1	94	5.2
Maximum cranial length	C-Group	175.7	40	5.8	182.7	34	4.9
	Kerma	179.6	156	6.7	187.1	96	6.4
Biauricular breadth	C-Group	111.1	35	4.9	119.3	20	5.5
	Kerma	112.0	137	4.8	118.2	89	5.4
Basion-nasion length	C-Group	96.7	26	4.2	101.6	20	4.3
	Kerma	98.8	119	4.2	102.8	77	4.1

Bolded font indicates values that are statistically significantly different at $p \leq 0.05$.

Principal components analysis (PCA) (with varimax orthogonal rotation to aid in the interpretation of the factors) was used to explore how individuals were distributed while simultaneously considering all of the variables. PCA is a data reduction technique that represents the variables with a smaller set of factors and removes redundancy in the set of correlated variables. The resulting factors contain virtually all of the information inherent in the original variables. The variables with the highest factor loadings are strongly associated with the equa-

tion for determining the factor score. Discriminant analysis was used to identify the relationship between the group variable (C-Group or Kerma) and cranial measurement variables and to define group boundaries. If this relationship is statistically significant, discriminant analysis can be used to predict values for the group variable given the cranial measurement variables. Males and females were considered separately. For the multivariate analyses, only crania with all measurements could be included.

The sample of C-Group individuals used in this study is curated in the Biological Anthropology Laboratory at the University of Copenhagen. The Scandinavian Joint Expedition to Nubia excavated these skeletal remains in 1963–4 (Vagn Nielsen 1970) from 24 archaeological sites (**Figure 1**) located in an area stretching from the modern Egyptian border to 60km south (this area is currently flooded by Lake Nasser/Nubia, Säve-Söderberg 1989; details regarding the specific cemeteries can be found in Vagn Nielsen 1970) and based on pottery date primarily to the C-Group IA–IIB periods (~2000–1600 BC; Säve-Söderberg 1989). The sample includes 118 females and 64 males.

Individuals excavated at the type-site of Kerma located just south of the 3rd Cataract represent the Kerma sample (**Figure 1**). The skeletal material was excavated by Reisner (1923a, 1923b; Dunham 1982) and came from tumuli (mounds of earth and stones over an underground grave). The largest tumulus had one or two main chambers, which contained the principal body and corridors with individuals thought to have been sacrificed. Subsidiary graves, assumed to be the bodies of officials, were placed between series of parallel walls (Dunham 1982). These graves date to the Classic Kerma period (~1750–1550 BC). The sample includes 179 females and 112 males.

Biological indications of group affinity

Using cranial measurements, the present study does not demonstrate considerable differences between the Kerma and C-Group samples. When individual measurements of the samples are compared using t-tests, only a few show statistically significant differences (**Table 2**). The Kerma females have smaller nasal height (46.0mm vs. 47.2mm) and larger maximum cranial breadth (131.4mm vs. 129.4mm), maximum cranial length (179.6mm vs. 175.7mm), and basion-nasion length (98.8mm vs. 96.7mm) in comparison to C-Group females. Kerma males have a larger maximum cranial length (187.1 vs. 182.7) in comparison to C-Group males.

Using PCA, factors 1 and 2 account for about 52% of the variance in females (**Table 3**, **Figures 2 and 3**). Factor 1 is most highly influenced by maximum cranial breadth (0.81), biauricular breadth (0.80), and bizygomatic breadth (0.71). Factor 2 is most highly influenced by upper facial height (0.91), nasal height (0.81), and cheek height (0.80). For males, factors 1 and 2 account for about 56% of the variance. Factor 1 is most highly influenced by biauricular breadth (0.89), bizygomatic breadth (0.85), and bimaxillary breadth (0.80). Factor 2 is most highly influenced by upper facial height (0.92), cheek height (0.89), and nasal height (0.85). For both sexes, loadings for all or nearly all of the variables are positive, which can be interpreted as a general size factor (Hardy & Van Gerven 1976). The plotted factor scores (**Figures 2 and 3**) show tremendous overlap of the two samples, confirming the similarities in craniofacial shape.

Discriminant analysis was used to identify the boundaries between C-Group and Kerma using cranial measurements. Wilks' lambda indicates if there is a significant relationship be-

tween the independent (cranial measurements) and dependent (C-Group/Kerma group) variables. The results of discriminant analysis for this dataset indicate that there is not a significant relationship. The eigenvalue of the discriminant function is 0.503, a low value that suggests it is not useful in distinguishing between groups. The Wilks' lambda is 0.665 and is not significant ($p=0.078$). In sum, these statistical analyses reveal no significant difference between the Kerma and C-Group samples using cranial measurements.

Table 3. Results of principal components analysis of cranial measurements (factor loadings, rotated).

↓Variable	Female				Male				
	Factor →	1	2	3	4	1	2	3	4
Eigenvalue	4.7	1.6	1.2	1.1	4.9	1.8	1.2	1.1	
Proportion of variance	0.39	0.13	0.10	0.09	0.41	0.15	0.10	0.09	
Nasal height	0.05	0.81	0.31	-0.05	0.30	0.85	0.08	0.04	
Upper facial height	0.10	0.91	0.17	0.12	0.11	0.92	0.19	0.07	
Nasal breadth	0.04	0.05	0.16	0.82	0.14	0.21	0.11	0.84	
Bimaxillary breadth	0.52	0.28	-0.01	0.50	0.80	-0.01	0.15	0.19	
Bizygomatic breadth	0.71	0.25	0.20	0.36	0.85	0.20	0.17	0.04	
Cheek height	0.25	0.80	-0.01	0.09	0.03	0.89	0.23	0.02	
Minimum frontal breadth	0.61	0.05	0.18	0.23	0.22	0.20	0.23	-0.61	
Basion-bregma height	0.28	0.18	0.78	-0.11	0.42	0.17	0.64	-0.12	
Maximum cranial breadth	0.81	-0.12	0.16	-0.31	0.68	0.16	0.08	-0.31	
Maximum cranial length	0.34	0.28	0.69	0.16	0.23	0.32	0.80	-0.06	
Biauricular breadth	0.80	0.28	0.16	0.17	0.89	0.20	0.25	-0.01	
Basion-nasion length	0.01	0.14	0.81	0.24	0.15	0.16	0.87	0.12	

Discussion

Cultural relationship between C-Group and Kerma

The inclusion of language evidence is difficult because no Nubian texts dating to this period exist that can help us understand how Nubians identified themselves in relation to one another and outside groups. O'Connor (1993) suggests that it is reasonable to assume that during the Bronze Age and later there was a relatively continuous stretch of agricultural villages along the Nubian Nile. During the Bronze Age, the rise of complex chiefdoms may have involved the combining of these groups in Upper and Lower Nubia (O'Connor 1993). It is proposed that Kerma initiated a sequence of unification and possibly continued as the capital of a unified Nubia. O'Connor (1993) indicates that C-Group and Kerma share some broad similarities but the archaeology and typology are somewhat different. However, Török (2009) comments that the affinities displayed in the early C-Group and early Kerma material culture could be explained as a result of Kerma influence on the material culture of newly settled C-group communities and does not necessarily indicate a shared ethnic origin.

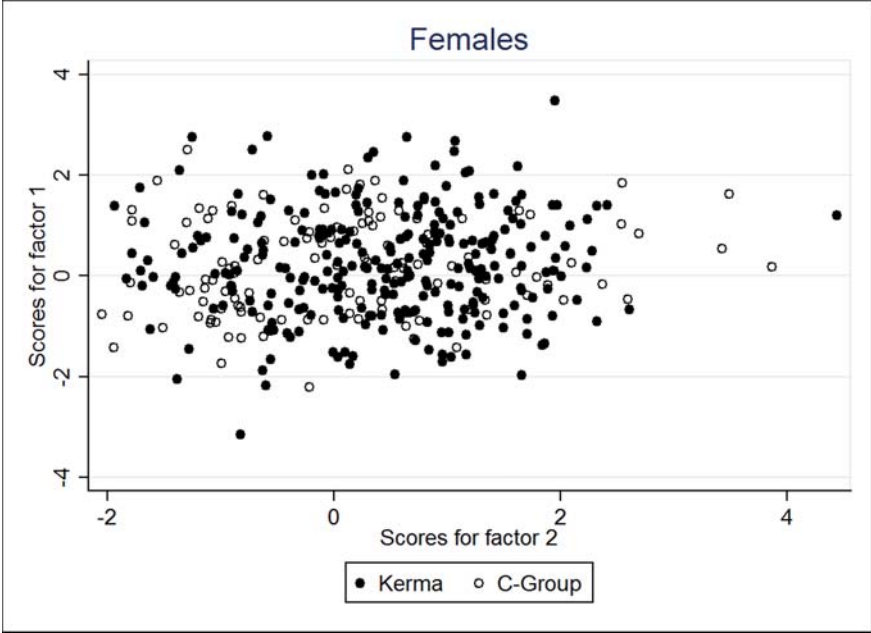


Figure 2. Principal components analysis of cranial measurements for females. Factor 1 and factor 2 scores plotted by sample group.

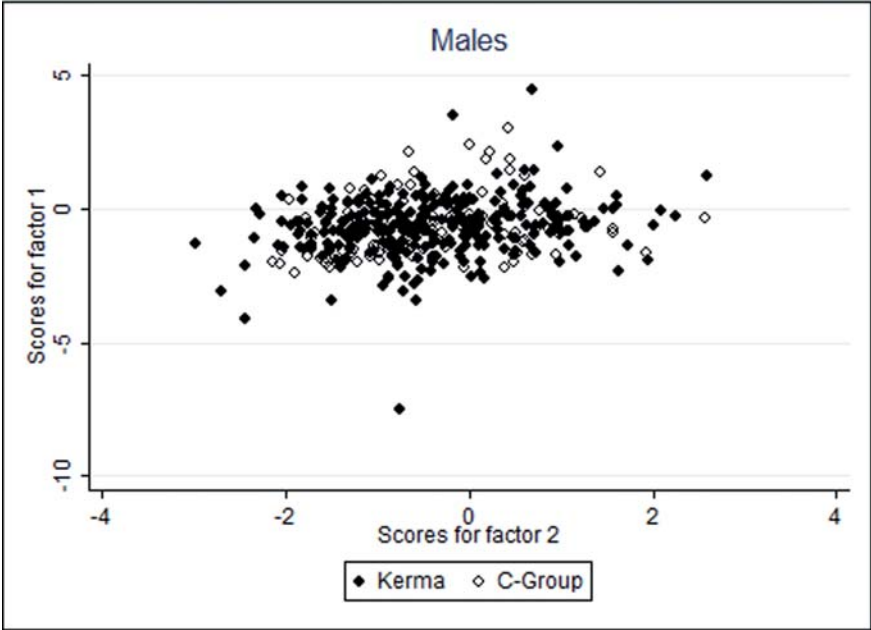


Figure 3. Principal components analysis of cranial measurements for males. Factor 1 and factor 2 scores plotted by sample group.

Alternatively, Edwards (2004) contends that rather than a discretely bounded regional culture in Lower Nubia, C-Group should now be considered part of the more extensive cultural tradition with its heartland in the Kerma area. Early C-Group and Early Kerma material culture show very close similarities, leaving little reason to doubt that people who moved into Lower Nubia inhabitants after the A-Group came from the Kerma area. He proposes that distinguishing two distinct cultures is problematic but concedes that regional variability is present. Ultimately, Edwards (2004) sees the distinctions between the groups as arbitrary, with as much cultural variability within the groups as between them.

Junker (1920), Adams (1977), and Hafsaas (2006–2007) support the idea of this link based on evidence that early burial practices in both areas are quite similar in that individuals are oriented in the same fashion—head towards the east, facing north—with comparable burial inclusions. Steffensen (2005) also demonstrates the connection between early C-Group and early Kerma with regard to burial orientation, funerary stelae, tumuli, and animal sacrifice inclusion. Kerma burials show a much greater usage of stone but this could relate to differences in landscape and available materials rather than to cultural differentiation. Adams (1977:199) asserts that the formal differences between C-Group and Kerma are relatively minor. He contends that they were at least ‘cultural cousins’ who may have emerged from a common ancestor with the most significant differences a result of relative scale and intensity of development rather than form. Correspondingly, Trigger (1976) proposes that C-Group was a modest and truncated reflection of the larger Kushite society.

Similar to the model presented by Jones (1997), Hafsaas (2006–2007) discusses the idea that C-Group had to define their identity while under constant influence from other ethnic groups such as Egyptians and Kermans. During 1650–1550 BC, Kerma occupied Lower Nubia, with a substantial concentration of Kerma sites in the Saras area (Smith 1995). Cultural distinctions between C-Group and Kerma were preserved over time in relation to each other and in close geographical proximity (Williams 1983). Hafsaas (2006–2007) posits that C-Group and Kerma were all part of a larger Nubian population but should be identified as separate ethnic groups within the Nubian identity. She supports this designation with Egyptian texts that use various names for groups in different geographical districts, which may reflect ethnic differences. Archaeological and epigraphic evidence from Lower Nubia indicates that Egyptian expatriates, C-Group, Pan-Grave, and Kerma people lived together in communities (Török 2009). While habitation sites may have been short-lived, cemeteries were important as actual territorial markers, demonstrated by the differences seen in the pottery used specifically for burials (such as the Kerma tulip beaker). C-Group and Kerma cooking vessels show a high degree of similarity perhaps reflective of their hidden position within the household sphere, while there is obvious difference between C-Group (black-incised bowls) and Kerma serving pots, which may have been used to express meaning and identity within society as well as to display identity to other ethnic groups (Hafsaas 2006–2007; Smith 2003).

Implications of the biological relationship between C-Group and Kerma

Given the complex cultural relationship between C-Group and Kerma reflected in archaeological remains and evidence for usage of these materials, how can the biological data be incorporated into our understanding of these groups? PCA and discriminant analysis do not demonstrate substantial differences in the C-Group and Kerma groups. Significant t-tests and

positive factor loadings for nearly all variables for Factors 1 and 2 suggest differences in size but not clear shape differences to distinguish the groups.

One possible explanation for this difference in size may be related to environmental factors. Kerma individuals lived in a region that is considered to be the most fertile and productive in Nubia where an exceptionally broad floodplain allows for a large cultivation area. Additionally, the presence of Nile paleochannels permitted natural basin irrigation and high agricultural yields. In contrast, the C-Group sample comes from a region considered to be the most barren and forbidding in Nubia, where the Nile valley is extremely narrow, confined by rocky crests and slopes rather than cultivable floodplain (Adams 1977). The poor environment in the C-Group region may have resulted in suppressed growth in comparison with the Kerma population; femur length of C-group individuals was found to be shorter on average than Kerma individuals (Buzon 2006b). Physical growth is affected by numerous factors including genetic influences, growth hormone deficiencies, psychological stress, as well as social and developmental environments and is recognized as a highly sensitive indicator of health (Huss-Ashmore & Johnston 1985; Larsen 1997). While the majority of studies have focused on long bone length and stature, some studies have demonstrated a relationship between growth disruption and cranial size as well, suggesting that poverty and disease are stressors that affect head size (Abu Dalou et al. 2008; Mulder et al. 2002). Size and shape of the adult head is achieved around the age of four. Thus, health and nutrition during the critical period of infant growth will affect adult cranial size (Abu Dalou et al. 2008; Dobbing & Sands 1973).

The availability of resources and favorable environment could be linked to higher social status in the Kerma sample. The communities represented by the Kerma and C-Group samples, while similar in material culture, display some notable differences in scale of society (Edwards 2004; O'Connor 1993). It is clear that settlement in the Kerma region was on a much greater scale than anything seen in Lower Nubia. However, this idea is difficult to test with the data available. C-group graves have been badly plundered, making the evaluation of elite and average burials problematic (Török 2009). For Kerma, it had been suggested that the remains excavated by Reisner and housed at Cambridge represent two biologically different groups—those buried in the more elite areas versus in the 'sacrificial' corridor (Irish 2005). However, Judd and Irish (2009) determined that these groups are not biologically different based on cranial measurements; they also do not differ in palaeopathological indicators of health (Buzon & Judd 2008). Additionally, despite the differences in cranial size, no other size or health indicators show any significant differences between Kerma and C-Group (Buzon 2006b).

It is essential to consider issues regarding the materials and methods when evaluating various analyses. For example, the curated samples of cranial remains available for Kerma and C-Groups may be biased, not representing the full spectrum of individuals in either group and may be affected by preservation as data for all variables are needed for multivariate analyses. Additionally, sample size issues also may play a role; due to preservation not all individuals allowed recording of all measurements. While different statistical techniques used by various researchers may influence the results (Godde 2009), the comparison of studies using different types of biological data (i.e., metric vs. non-metric) can be problematic as the various classes of data may represent distinct aspects of biological relatedness and are differentially affected by developmental plasticity, environmental adaptation, and objectivity in data collection (Relethford & Lees 1982; Tyrrell 2000).

Irish (2005) demonstrates that A-Group and Kerma may have an ancestral relationship, but C-Group appears significantly different from both A-Group and Kerma based on dental

non-metric traits. How can these results be reconciled with the data in the present study? In addition to possibly representing different aspects of biological relatedness, as mentioned above, it is possible that these dental non-metric trait data reflect a scenario where closely related pre-Kerma and A-Group coexisted during the Neolithic period, subsequently developing into the Kerma group. It is possible that the A-Group individuals who fled Lower Nubia after being expelled by Egypt may have taken a slightly different population trajectory during the hiatus and reoccupation of Lower Nubia, perhaps combining with the other groups in the region or being affected enough by genetic drift in their small group size or genetic bottleneck to become sufficiently distinct, at least in some biological aspects. Methodologically, the samples used in the present study and Irish's study may be composed of different individuals due to the preservation of dentition and crania.

The similarities and differences in C-Group and Kerma material culture and evidence for behaviours support the idea of some level of cultural relatedness, though not complete similarity. Common ancestry is indicated by the lack of shape differences in cranial measurements for the Nubian groups from Kerma and C-Group regions. However, people in the C-Group and Kerma communities may have viewed themselves as distinct (albeit likely biologically related) social groups existing in a multi-ethnic region. As genetic and cultural relationships need not co-vary, biological affinities, while providing information about population history, do not necessitate a particular cultural association. The differences as indicated by archaeological remains could indeed suggest that they are separate ethnic groups within the larger Nubian group identity who made a special effort to display their differences in public contexts such as burials and feasting (Hafsaas 2006–2007; Smith 2003).

Conclusions

As ethnic identity is determined through self or outside perception of cultural differentiation and/or common descent (Jones 1997), it is sensible to consider both cultural and biological systems. The reconstruction of past ethnic groups provides a means to explore the social and genetic dynamics of ancient societies. The examination of biological affinities between groups in conjunction with archaeological indications of cultural identity can be a useful tool in tracing a group's population history when used with appropriate samples. This study explored the cultural and biological identity of two Bronze Age Nubian groups, C-Group and Kerma. Analysis of archaeological material remains and evidence for the use of these materials indicates that while these Nubian groups appear related, they were certainly not indistinguishable. Examples of the use of pottery and mortuary practices in specific contexts suggest the desire to display unique ethnic or social features within a multi-ethnic community. Assessment of cranial measurements using discriminant analysis identifies few distinct biological differences between these cultural groups; PCA indicates size rather than shape accounts for the variation in the crania. The larger size of the Kerma crania in comparison with the C-Group crania may be related to environmental or possibly social differences, though the necessary contextual information to test this idea is incomplete.

Through the combination of various types of archaeological and biological data, this study has provided a more nuanced understanding of two contemporaneous past cultural groups. While common ancestry is suggested, the fluctuating trajectories and environments of the C-Group and Kerma resulted in cultural variation. Contact and conflict with various cultures in

the region such as Egypt, Pan-Grave, and other desert nomads in addition to each other may have led to and maintained the apparent cultural differentiation. This integrative research provides the opportunity to investigate the relationship between cultural and biological affinities in a particular situation and broadens our knowledge of ethnic group dynamics.

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