

# **Why Cannibalism?**

Determining the type of cannibalism and the  
resulting implications of culture based on  
variation in human bone assemblages

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## Abstract

While simply determining the presence of cannibalism at an archaeological site can be difficult, determining the specific type of cannibalism that occurred can often be more difficult and overlooked at many sites. This paper looks at the difficulty, yet importance of determining not only that cannibalism occurred but also the type of cannibalism that occurred based on the patterns of modification found in human bone assemblages at archaeological sites. While the act of cannibalism can tell us a lot about a society on its own, the type of cannibalism can tell us much more and give an insight into the cultural significance behind the archaeological bone assemblages that have puzzled scholars and the public alike for years.

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## Introduction

While simply determining the presence of cannibalism at an archaeological site can be difficult, determining the specific type of cannibalism that occurred can often be more difficult and overlooked at many sites. This paper looks at the difficulty, yet importance of determining not only that cannibalism occurred but also the type of cannibalism that occurred based on the patterns of modification found in human bone assemblages at archaeological sites. While the act of cannibalism can tell us a lot about a society on its own, the type of cannibalism can tell us much more and give an insight into the cultural significance behind the archaeological bone assemblages that have puzzled scholars and the public alike for years.

Cannibalism. Anthropophagy. No matter what one calls it, the consuming of one's own species is a fairly universal taboo for most cultures in the world. Despite this taboo many cultures in both the ancient and modern world have had reported claims of cannibalism. This deviation of a social norm has led to a fascination with the motives behind the act of cannibalism. Notable exceptions to this taboo are found among the behavior of certain individuals in the Korowai tribe of southeastern Papua New Guinea and with the behavior of certain individuals in the Fore tribe in New Guinea. *Cannibal*, coming from the Spanish word *Canibal*, was first used by Christopher Columbus as a name for the Galibi people, but later became a proper name for the Carib tribe of the West Indies who engaged in the act of eating other humans (Dongoske 2000). Cannibalism is a very prominent yet controversial topic in archaeology today due to the large number of archeological sites containing assemblages of modified human skeletal remains. However, it is still a label that needs to be assigned with great care because of the extreme connotations and stereotypes that come along with the label.

Cannibalism is broken down into many different categories based not only on who is consuming whom but also based on the reason for consuming another individual. Exocannibalism is eating those outside your group and is the most widely accepted form, while endocannibalism is eating those within your own group (Dongoske 2000). Ceremonial or funerary cannibalism is consuming the deceased in an affectionate or compassionate manner, normally only involving within-group members, for example in China where the deceased were once consumed to show love and respect (Turner and Turner 1999). Ritual cannibalism is when consuming others is based on a culture's belief system that the ingestion of other humans has spiritual or psychological outcomes. Certain tribes in North America believed that when the flesh of an enemy was consumed their characteristics (such as eating the heart of an opponent to bring courage) were transferred to the person eating the flesh. Vengeance or revenge cannibalism is done with the intent to dishonor or degrade another, normally in a violent or war setting such as the Carib Tribe in the West Indies who ate their captured enemies after battle. Vengeance cannibalism can also be done to intimidate or eliminate neighboring tribes or villages. Starvation-induced cannibalism is done as a survival method, such as what the Donner Party partook in when stranded during the winter of 1846 in the Sierra Nevadas. Gustatory cannibalism is done outside of starvation conditions but not done in a funerary manner. Here cannibalism may be done simply because individuals like the taste (Carbonell 2010). Finally, individuals who are mentally ill, such as Jeffrey Dahmer, can engage in psychopathic cannibalism (Turner and Turner 1999).

Not all modified human bone assemblages are caused by cannibalism; White (1992) describes 17 important variables to look for when first assessing the possibility of cannibalism at a site. Bone modifications such as fragmentation, internal vault release, inner conchoidal scars,

crushing, percussion pits, adhering flakes, peeling, cut marks, chop marks, polishing, intentional scraping, percussion striae, rodent gnawing, carnivore damage and burning are all among the suggested 17 observations. The likelihood of human involvement greatly increases when a percussion stone or anvil was the cause of the bone modification. The use of an anvil or percussion stone, however, is not easy to prove even when these tools are found in close physical association with the human bone assemblages. This lack of proof leaves the possibility that the modification was caused by something other than human involvement, such as trampling or geological processes such as weathering or erosion. These tools, however, can be the cause of abrasions due to the bone slipping on the stone anvil at the moment of impact; percussion pits and chop marks are also other indicators of stone tools. It is important to pay special attention to the sites of tendon and muscle attachments and joints. These sites are the most likely to exhibit tool marks, burning or crushing due to the high nutritional pay off of the meaty muscle, tendons and bone marrow. Although these are the sites most often focused on when processing animals for consumption, a comparison that is used to support cannibalism, they are also the sites that are focused on if a body is being dismembered for storage or burial, therefore these marks must be accompanied by other signs of cannibalism, which will be discussed later in this paper. Ritual defleshing was a common occurrence in the southeastern United States which shows the problem of equifinality, or two different causes leading to a similar outcome when it comes to determining the cause of modified human bone assemblages.

A relatively low count of vertebrae is also an indicator that cannibalism may have occurred at a site. Scholars, however, are unsure as to why low counts of vertebrae may indicate cannibalism. A possible explanation given by Hurlbut (2000) is that vertebrae were smashed and boiled for grease extraction, a technique that may not leave much evidence of the vertebrae.

However, one can then argue that fragments would be readily found due to the loss of interest by animals thus enhancing their survivorship because of the lack of grease. This practice would also leave fragments, however small, which would be fairly simple to determine as human due to the unique nature of the human vertebrae. Lyman (1994) places vertebrae in the low-density column of bones, making them very susceptible to damage and destruction. This susceptibility to weathering, chemical processes and breakdown seems like a more reasonable explanation for a low vertebrae count at an archaeological site, as they simply get destroyed before sites are excavated. Low vertebrae counts are a recurring aspect of many mass burials and therefore, while unexplainable at this time, have been a pattern consistent with high violence perimortem bone modification. Along with markers on the actual bone, the lack of any evidence for even the most basic of burials is also an important indicator of possible cannibalism.

Although cannibalism is a very hot topic for anthropologists today, it is almost impossible to determine with one hundred percent accuracy that the consuming of human flesh occurred at prehistoric sites. It is undoubtedly accepted that human bone assemblages at certain sites have undergone modification in the respect of muscle and marrow removal, burning, fracturing and crushing but this osteological evidence does not prove that cannibalism, or the actual consuming of human flesh, occurred at a site. Many other explanations such as postmortem mutilation of warfare victims, ritual execution of witches, post-mortem study by other members of the society to study disease, trauma or determine a cause of death or defleshing of bodies for storage of remains or secondary burial all exhibit similar outcomes when making observations of bone assemblages (Hurlbut 2000). The incredible variety of human burial practices, past and present, has also presented a problem. It is common practice for bodies to be burned, dismembered, buried in bundles, fed to animals or set adrift, which makes it extremely



hard to conclude cannibalism as the cause when many other practices modify bones in a similar manner (White 1992). It is important to remember that while many explanations exhibit similar outcomes, the specific combination (i.e. equifinality) of traits when cannibalism has occurred is different and can be the key in determining what process caused the modification. The standard combination of taphonomic traits used to determine cannibalism as stated by Turner and Turner (1995) includes perimortem cut marks, intentional breakage, burning, anvil/hammerstone abrasion and missing vertebrae. A much more definitive form of evidence than observations of bone modification for the practice of consuming human flesh is the recovery of coprolites at a site. Coprolites, or preserved human waste, are very rare finds at prehistoric sites. These trace fossils can be tested for myoglobin, a specific human-derived iron and oxygen binding protein found only in human skeletal and cardiac muscles, which means the only way for it to appear in human feces is by the consumption of human flesh. This protein has the potential to provide a greater degree of accuracy when it comes to determining whether or not human flesh was actually being consumed at the time or if bodies were just being ritually processed (Marlar 2000). Coprolites, which can reveal not only if human flesh was ingested, can also provide information on the rest of the individual's diet, which can aid in determining the type of cannibalism that occurred. Although they are important, coprolites are not very common at prehistoric sites due to the ease with which human feces can fragment, be destroyed or simply decompose before it has a chance to either become desiccated or fossilize (Marlar 2000).

This lack of proof is also something that needs to be considered before the claim of cannibalism, even as a possibility is made. Cannibalism is a radical label to place on any group of people if the proper amount of proof is lacking. This lack of certainty, along with the sensitivity of the topic, may be why some scholars are hesitant to accept cannibalism as the sole

cause of bone modification at prehistoric sites and are keen on suggesting and accepting alternatives (Hurlbut 2000). Even if the act of cannibalism is undeniable at a site, say by the presence of myoglobin in feces, the reasons for consumption are still unknown. Whether the consumption was based on honoring a relative or to degrade an enemy the first thought of most is a negative one, which leads to the importance of determining not only that cannibalism occurred but also why. Contemporary ancestors of these groups need to be kept in mind when claiming that a certain tribe or clan practiced cannibalism, for whatever the reason, in the past. These allegations can very negatively affect contemporary Native Americans or more specifically the groups facing the harshest claims such as the Ancestral Puebloans in the United States. Most Native American groups have already had to face and overcome dehumanization and oppression to justify the removal of their land and treatment, and the claim of cannibalism could only fuel the old perceptions of these tribes to the general public (Dongoske 2000).

Although it is important to realize the magnitude of the accusation of cannibalism, it is not something that should be overlooked or ignored simply because of the effect or label that would be placed upon the living contemporary ancestors of tribes or societies that practiced cannibalism. The minimal criteria for inferring cannibalism as stated by White and Turner and Turner are extremely rigorous, possibly even to the point of overlooking other prehistoric sites where cannibalism occurred but where the evidence doesn't meet all of their criteria for acceptance. Turner and Turner (1999) even address the concern of what the allegation of cannibalism means '... our criteria for hypothesizing cannibalism are probably too rigorous, but given the extraordinarily controversial nature of the topic, we believe it is best to err on the side of conservatism'. Before the evidence of cannibalism at an archaeological site is published or publicly stated it is important to have obtained as much information as possible from the site and

to have entertained all other known possibilities, which is an impossibility because if the idea hasn't been thought of yet then it can't be considered. In the end cannibalism must be studied and assessed the same as any other human activity and without bias from the scientists or researcher, although this is unlikely because of the harsh negative connotation and therefore built in bias our society has of the word "cannibalism" no matter the reason.

Despite the fact that cannibalism is a fairly universal taboo and an extremely strict one in modern western industrial societies, it still has occurred in many forms throughout the world. This anomaly in human behavior is why there is such a fascination with the subject by anthropologists and the public alike. There is no one reason why cultures choose to disobey the taboo against cannibalism, but the most common reasons will be addressed later in this paper. By studying the skeletal remains of possible prehistoric cases and comparing them against modern day examples we are better able to understand the phenomenon of consuming other humans, for whatever the reasons. This better understanding of a single aspect of human mortuary practice can also lead to a better understanding of the culture of that society and perhaps also the world at that time.

Throughout this paper I will be mainly analyzing and looking at sites in the American southwest, more specifically at the work done by White (1992) in Mancos Canyon (Colorado) at site 5MTUMR-2346 and Turner and Turner (1999) throughout the southwest. I will also be looking at the Mesa Verde and Cowboy Wash area where human coprolites have been found containing myoglobin. Examples and articles from several European sites have also been analyzed for this paper but these European sites are not the main focus and will be used for background information only.

## **Bone Modification Evidence (Taphonomic)**

There are five standard criteria for proposing cannibalism at a site, cut marks, fractures, burning, missing vertebrae and hammerstone abrasion. Below, cut marks, burning and fractures will be looked at in more depth, along with biochemical and site evidence for cannibalism. While these criteria, with the exclusion of one form of biochemical (i.e., the presence of human myoglobin), cannot explicitly prove that the actual consumption of human flesh and not just disarticulation and defleshing of bodies occurred they can provide strong evidence for it. These criteria can also help in determining the type of cannibalism, if applicable, that occurred at each site. Until further technology or evidence appears the proposal of cannibalism at sites will rarely be a hundred percent accurate due to the limited proof of consumption. Not many archaeologists argue that defleshing and disarticulation was occurring at these sites, but without further or more clear-cut evidence many are hesitant to state that consumption of humans was occurring at the majority of these sites.

### **Cut Marks**

One of the most common and clear-cut criteria of the five standard taphonomic qualities needed to identify cannibalism is the presence of cut marks. Cut marks can be informative not only about the processing of the body but they can also help determine the type of cannibalism or practice occurring (Turner and Turner 1999). Cut marks are V-shaped notches across the external surface of a bone. Multiple irregularities within the notches, due to the imperfect cutting edge of flint tools, are indications of human processing rather than grooves or scoring produced by small carnivores. Unmodified flakes or blades made of obsidian or other very fine-grained materials produce fine, even cut marks, whereas broader and more irregular cut marks result from

retouched tools, especially those made of coarser –grained materials such as cherts, limestone or quartzite (Turner and Turner 1999).

There have been extensive studies of cut marks done by archaeologists such as Rautman and Fenton (2005) and White (1992), not only on animal bone assemblages, but also on confirmed cases of archaeological and ethnographic cannibalism for comparison with possible cases of prehistoric cannibalism. These studies, and many others (Abe 2002; Binford 1981; Blumenschine 1996; Dominguez-Rodrigo 2005; Egeland 2011; Lyman 2005; Potter 2005), have made it as straight-forward as possible when it comes to determining the presence of human produced cut marks on bones. Alferd Packer, a participant in the late nineteenth-century Colorado gold rush is a confirmed case of cannibalism that was studied by Rautman and Fenton (2005) for prehistoric comparisons. During the winter of 1874 Packer and five other men became stranded in the wilderness, near Lake City, Colorado; Packer admitted to then murdering and cannibalizing his companions to stay alive. In 1989 the bones of the men were excavated and analyzed to create a model of the kinds of damage to bones that resulted from a documented case of survival cannibalism.

Within the Packer bone assemblage, Rautman and Fenton found that the majority of cut marks made on long bones (95%) occurred at the distal and proximal ends of the shaft, which are the regions of long bones that contain the largest muscle and tendon attachment sites. These cut mark locations are consistent with removing meat from the body, unlike cuts that result from disarticulation of limbs, which usually are concentrated on the epiphyses. Along with the cut marks found on long bones most of the other cut marks on the axial skeleton occurred on bones and more specifically regions of bones containing the largest muscle attachments. Rautman and Fenton's observation that most cut marks were associated with meat removal coincides with

observations made by Hurlbut (2000), Lambert (2000) and Turner and Turner (2005). Along with finding cut marks near sites of large muscle attachments Rautman and Fenton (2005) also noted that cut marks were made when the bones were still fresh (“green”) or shortly after the death of the individual. Green-bone cut marks or fractures can be determined by obtuse or acute cut mark angles with smooth margins and surfaces as opposed to the right angle cut mark of dry, older bones (Villa 1991). If the outside surface of the bone and inside the cut mark or along a fracture line are similar in coloring due to weathering one can also determine that cut marks or fractures occurred when the bone was still green (Villa 1991). However, this modification of bones shortly after death is equally consistent with cut marks produced during the deliberate destruction of the body following the execution of witches, violence and war, and some cases of secondary burials, making it an undiagnostic characteristic of cannibalism (Hurlbut 2000).

Although long bones are a common site for cut marks they generally exhibit less than half of all cut marks found in a bone assemblage (human or animal) (Billman 2000; Lambert 2000). The axial skeleton in humans, or more specifically the ribs, vertebrae, clavicle and scapula, contain the majority of cut marks. These bones contain more cut marks due to the ease of striking multiple bones when such bones are in a close proximity to each other (i.e. ribs) (Rautman and Fenton 2005). They also display a large number of cut marks due to the large amount of meat that can be removed from these areas and because in cases such as the ribs and vertebrae the bones are close to the surface and easily hit with tools when removing skin or outer layers of muscles.

Although cut marks found near muscle attachment sites are clear indications of meat removal, cut marks found on facial bones, as in the Ram Mesa project 70 km southwest of Chaco Canyon, can show that food processing may not have been the reason behind perimortem

modification. Cut marks not associated with major muscle regions or with disarticulation of the skeleton, such as the large number of facial cut marks found at the Ram Mesa site in northwestern New Mexico, are more compatible with deliberate mutilation of a victim of warfare or other violence, some ritual modification of the body such as defleshing for burial or the possibility of witch execution (Darling 1999; Ogilvie 2000).

Random orientation and multiple cut mark directions on bones such as Rautman and Fenton (2005) observed on the Alferd Packer assemblage indicate the possibility that each body part was processed independently of the rest of the body and therefore that meat removal was done on an “as needed” basis, which might be expected in the case of survival cannibalism. These random orientations show that rather than turning disarticulated parts of the body in a systematic manner in order to remove the meat, all parts were still attached and the butcher was moving his position relative to the body and his tool rather than the body itself. Turner and Turner (1999), in discussing prehistoric cases of probable cannibalism, attribute random orientation of cut marks to butchering done in haste or by someone with limited butchering skills. Although randomly oriented cut marks can simply mean that the butcher was not skilled, they can also indicate that more than one person was involved in butchering at the same time, or that the same area was returned to multiple times to remove more meat. These random orientations are unlike the parallel, consistent cut marks expected if a body were being defleshed for secondary burial or ritual. With ritual-type cannibalism, or just ritual defleshing without the consumption of the flesh, a skilled member of the society, often a priest or shaman would perform the bone modification due to the importance surrounding the act or modification.

The orientation of cut marks has been the focus of attention in other contexts as well, such as at the Canto Butte Ruin 3, four miles west of the petrified Forest National park in

northeastern Navajo County Arizona; there, the human remains have multiple short cut marks all aligning and running parallel to one another (Turner and Turner 1999). These parallel marks may indicate a onetime meat removal done by a skilled butcher, or they may indicate that a skilled person as stated above was processing the bodies for something other than consumption, such as secondary burial or ritual. Mancos 5MTUMR-2346, evaluated by White (1992), also shows very clear evidence of short, parallel cut marks on long bones and on the bones of the axial skeleton. White considered both of these bone assemblages to be the result of cannibalism, not other causes of bone modification, due to the combination of cut marks together with burning, low vertebrae count and distinctive bone fractures. While parallel cut marks may indicate skilled defleshing, parallel cut marks have also been observed in human bone assemblages attributed to human violence as was reported at the Wupatki site by Turner and Turner (1999). Therefore parallel cut marks, while indicating that defleshing had occurred gives little information about the reason behind the defleshing. Stiner (2009), however, noted that cut marks on Near Eastern archaeological bone assemblages dating to the Middle Paleolithic and later show more regularity in the orientation than those she documented on late Lower Paleolithic assemblages. She suggests that the appearance of more regular cut mark patterns after about 300,000 years ago implies that butchery had become more standardized and perhaps the work of a smaller number of skilled butchers. These observations led Stiner to conclude that more regularized forms of butchery by a subset of the population might be an indication of the emergence during the Middle Paleolithic of more formalized rules of meat-sharing and hence a more socially organized society. Even though Stiner (2009) argues for a more socially organized society with the appearance of regular cut marks this plays no role in the actual determination of cannibalism at much younger sites such as those in the southwest. This proposed organization



and advancement of societies can however help in determining the type of cannibalism occurring, which will be discussed later in this paper.

## **Burning**

Of the five main taphonomic criteria needed to propose cannibalism the presence of burning is the most difficult to identify and the easiest to overlook in archaeological sites due to the similar effects of weathering on bone. Burning can cause a change in color from white to light brown to black, create thermal flaking along the bone, lead to charring and if placed in high enough heat can change the structure of the bone producing calcination (Turner and Turner 1999). While burned bones may have been used for fuel, been burned as a form of disposal or accidentally placed close to a fire, distinct patterns such as differential or patchy distribution of burning among single elements of bone assemblages have been observed. These patterns can lead to the conclusion that at certain archaeological sites bone assemblages have been roasted, boiled or heated to remove meat, bone marrow and grease. While some may argue that burn marks are the result of intended cremation, the lack of calcining and only moderate burn evidence at most sites is more indicative of cooking fire exposure rather than the intense heat needed for cremation (Lambert 2000). White (1992) has also introduced the concept of pot polish, or end polishing as it is some times called, as another indicator of cannibalism that is linked to burning. When fractured bone pieces are continually stirred in a pot the fractured ends appear shiny and ivory-color under magnification.

Of all the sites analyzed for this paper, the majority reported fracturing before burning. One indication of fracturing before burning is differential burn patterns or levels of burns found on bone fragments of the same element or bone. This technique removes not only the bone

marrow but can also show the use of pot cooking. Based on observations of burn patterns made by White (1992) at the Mancos site 5MTUMR-2346 near Mancos Canyon in southwestern Colorado, different parts of the body were processed differently. Both the humerus and radius show evidence of fracturing before burning, with fractures occurring at the distal end of the shaft in both cases. These positions of fractures before burning on the long bones of the arm also show marrow processing. Both bones also show variation in burn patterns, leading to the conclusion that there was still overlying muscle on the bones when they were cooked, which is additional evidence for the use of cooking to process the meat before removal from the bone. By fracturing the bones before burning and then cooking them in a pot while the bone still contained meat, cultures decreased both the time and energy needed to remove and process the bones. It is easier to remove cooked meat from a bone, and once the meat is removed smashing the heated bone will yield marrow with relative ease.

The minority of sites analyzed indicated that burning occurred before fracturing. This pattern of burning before fracturing gives strong evidence for roasting as a preparation technique. It can also give indications of marrow processing, although unlike fracturing before burning it is not as strong. Burning before fracturing can also indicate grease processing. The Anasazi assemblages in Colorado studied by Turner and Turner (1994) are one such example of burning before fracturing. Distinct burn patterns on the bones such as differential or patchy distribution of burning is the result of some areas being covered with muscle, preventing that area of the bone from being burned, or from being burned to a lesser extent than the other non-covered areas. Grease extraction is also a common result of burning before fracturing. If the bone is fractured before cooking the grease will leak out and be diluted by the water, but if a complete bone is

boiled then smashed the grease can be drained into a separate container and retain the maximum nutritional value.

Along with the difference in the timing of fracturing, whether it occurred before or after burning, the types of bones burned and the area burned also varies between sites. This variation is due to the different quantities of food different parts of the body yield (Metcalf 1988). Utility indices created by Binford (1978; see also Jones 1988) for caribou indicate that the tibia and femur have the largest marrow cavities and therefore yield the highest calorie per hour output. Therefore it would make the most sense that the tibia and femur would be the most heavily processed bones and show most often fracturing before burning. This pattern of fracturing before burning, however, is not seen in the long bones of the leg (femur, tibia and fibula) found at the Mancos 5MTUMR-2346 site, which was analyzed by White. These bones do show fractures at the distal end of the shaft, which is consistent with removal of bone marrow after heating the bone. They also show patchy distribution of burning indicating that muscle was still on the bone when burned. The next bones with the highest bone marrow content are the long bones of the arm (humerus and radius). These bones also show fractures at the distal shaft end consistent with marrow removal. Along with the long bones, the element with the next highest rate of burning and fracturing was the ribs. These bones contain little marrow, which means the high burn rate is not related to marrow processing or nutritional/survival cannibalism and is more likely related to ritual cannibalism or simply defleshing of the body without consuming any of it. The ribs contain a relatively large and easy to remove source of meat, therefore a high burn rate for ribs may be due to roasting the meat rather than processing marrow.

Pot polish is not a mutually exclusive indicator of cannibalism. It can also be caused by transport of bones, cleaning, and other post excavation acts (Hurlbut 2000). Pot polish, however,

found with other diagnostic features of cannibalism, such as anvil abrasion, fractures and burning can strengthen a case supporting the act. Pot polish is not found at all reported sites of cannibalism, and while some anthropologists use this to write off pot polish as an indicator of cannibalism a much more likely explanation is that stirring while cooking bones in pots did not occur at all sites. Pot polish, therefore, can strengthen a case for cannibalism but the lack of pot polish does not argue against it. Along with the evidence of pot polish large bones that have been broken into many fragments before burning can also show the occurrence of boiling or the use of a pot. Again this boiling of fractured elements is an indication of cannibalism because of the grease and marrow that can be extracted from a bone when it is heated and smashed.

The occurrence of pot polish, along with marrow and grease extraction is not only an indication of cannibalism but it also helps in determining the type of cannibalism occurring. Marrow and grease extraction are an example of intensive exploitation of the human bone assemblages. This exploitation of resources leans towards the idea of survival or nutritional cannibalism rather than ritual or degrading types of cannibalism, an idea that will be discussed later in this paper.

## **Fracturing**

Fracturing is a common occurrence for a multiplicity of reasons at archaeological sites. However, there are several characteristics that help in determining whether or not a bone has been purposefully fractured or if it was due to sediment loading or due to carnivores. Dynamic loading, which can occur due to the use of anvils or hammerstones, creates breakage along splint line fractures. If sediment compaction was the cause of the fracture the breakage would be incomplete and the bone fragments would be in relative close anatomical arrangement to one

another (Villa 1991). Carnivores would also cause static loading with their jaws rather than dynamic loading, another indicator that the fractures were caused by humans. Fracturing is also the most common indication of bone marrow processing (Defleur 1999).

Bones at the Mancos site 5MTUMR-2346 studied by White (1992) show fracture patterns that remained fairly similar among the same bone, but fracture patterns were very different when comparing different bones. Fracture patterns found among the craniums were consistent with repeated blows to the skull and were not associated with processing of the body. These fractures may indicate that the individual was murdered and did not die of natural causes. This brutal cause of fractures indicates that violence or revenge rather than ritual cannibalism may have been the reason behind this bone assemblage. Among the small sample of vertebrae found at the site most contained just slight fractures (White 1992). The majority of ribs however were fractured at the proximal end and separated from the rest of the rib. While it is unlikely that this is due to marrow processing because of the low marrow content it could be due to the removal of large back muscles attached to proximal end of the ribs. The clavicle showed the most crushing of all the axial skeleton bones, indicating that it was a good source of grease. The humerus, radius and ulna all showed crushing near the less dense, proximal, spongy ends of the bone, which is consistent with grease and marrow extraction. The radius also showed lots of fractures at the middle of the shaft, while the humerus had many fractures at the proximal and distal ends. While the tibia experienced little fracturing both the femur and the fibula showed crushing at the proximal ends and fractures mid shaft. These sites of crushing and fractures are also indicative of grease and marrow processing. Along with the long bones of the body, the bones of the hand and foot were also processed at this site. These bones were also crushed, staying consistent with the processing of grease and marrow in the other bones of the bodies. This high level of processing

of the bodies for marrow is a strong indication that if consumption was occurring here it was for nutritional or starvation reasons rather than revenge or ritual cannibalism.

Other sites, such as Pueblo Bonito near Chaco Canyon in northwestern New Mexico, experienced little fracturing throughout the entire human bone assemblage. One constant in fracturing at this site was the breakage of the coronoid and condyle processes on the mandible (Turner and Turner 1999). These fractures could be associated with violence and warfare due to blows struck to the skull, or they simply could be from the handling by tribe members of the skulls after modification or processing. In contrast, some sites in the southwest four corners region analyzed by Hurlbut (2000) showed as much as a 100% fracture frequency. These bones were extensively processed into uniformed sizes, a sign that they were cooked or roasted in a pot, leading to the need for the bones to be broken into certain lengths to fit in the pot. Bones analyzed by Lambert (2000) at site 5MT10010 in Colorado also contained high percentages of fractures. Of the bone assemblages, 67.8% of the bones were fractured at least once. Lambert (2000), however, noted that there were few hand and foot bones and of the few found none were fractured or crushed. This lack of processing may indicate that starvation or nutritional cannibalism was not the cause of this bone assemblage, and more likely it was due to ritual or warfare cannibalism. There was also little tool and cut marks near the fractures indicating that the bone was still heavily covered in muscle when the fractures occurred and the purpose of fracturing the body was to reduce or disarticulate it. Villa (1991) also noted that at the Fontbregoua site in Southern France many of the fractures had cut marks running across them, showing that bones were first cut then fractured, a practice which is consistent with the removal of large muscle groups only and cooking or roasting the smaller muscles right on the bone (Villa 1991). Villa (1991) also noted that if bones were found scattered at all, (as in all the sites

analyzed for this paper) then the cause was most likely a human or carnivore unlike fractured bones with pieces still in anatomical position indicating that sediment loading may have been the cause.

While fracturing can play a large role in determining the reason for burning, it has little influence on its own to propose cannibalism. Fracturing can indicate grease and marrow processing and processing to fit into a cooking pot but it can also indicate processing of a body for secondary burial or simply accidental breaks due to carelessness with the body of a deceased. Therefore fractures can help to strengthen a case of cannibalism but need to be accompanied with cut marks, burns or hammerstone abrasion to be a reliable indication of cannibalism.

### **Biochemical Evidence**

Biochemical evidence, although limited, is the most diagnostic form of evidence for cannibalism in the archaeological record. With the use of new techniques such as the immunological detection assay method (ELISA) and immunoelectrophoresis, the presence of blood on tools and certain human-derived substances such as myoglobin can be detected (Marlar 2000). Although the use of ELISA in determining human-derived substances from human feces has yet to be rigorously tested, supported and its result duplicated by other scientists, it is the most promising tool for accurate determination of cannibalism. This technique, however, still has its limitations in that the reasons behind cannibalism (i.e. ritual, to degrade etc.) are still left to observations of bone assemblages and surrounding artifacts.

Coprolites, or preserved human feces, are the only evidence that can prove that actual consumption of human flesh occurred. Although coprolites have the potential to prove the practice of cannibalism at archaeological sites they are very rare and have only been analyzed at

one site with the potential for cannibalism. This coprolite that has been analyzed was found at site 5MT10010 by Cowboy Wash in Colorado in one of the hearths located in the site (Billman 2000). Feces can be tested for the presence of human myoglobin, a protein that transports and stores oxygen within muscles. Each mammal's myoglobin is distinct and therefore cannot be confused with other species. Along with being species distinct, myoglobin is also only found in cardiac and skeletal muscle cells, which means that it can not be transferred into feces through any process other than ingestion of human muscle (Billman 2000). The coprolite found at Cowboy Wash contained human myoglobin demonstrating that at this particular archaeological site at least one individual consumed human flesh, although why cannibalism occurred is still undetermined.

Although coprolites provide the most definitive support for a case of cannibalism, there is other biochemical support for cannibalism at archaeological sites as well. Tools, such as sharp flakes or blades, found in close physical association with human bone assemblages can be tested for residue of human blood. Multiple sites such as site 5MT10010 near Cowboy Wash and Sleeping Ute Mountain, Colorado analyzed by Billman and Lambert found that the two flakes sharp enough to cut flesh tested positive for human blood (Lambert 2000). The human blood residue on these tools may indicate that they were used to deflesh or disarticulate a body. Biochemical tool evidence, while it may support cannibalism can also support other causes of bone modification. While human blood on tools can indicate that processing of a body occurred, it is not specifically indicating that after the body was defleshed or disarticulated that it was consumed. Therefore while residue of human blood on tools can help to strengthen a case for cannibalism it could also have been from the practice of defleshing for secondary burial or witch execution. Blood residue could also simply be from a butcher cutting him/herself while



processing a kill. The use of flakes as processing tools can cause frequent cuts and scraps on the hands of the person using it, this common occurrence would also leave human blood residue on sharp tools. Human blood residue found in cooking pots is also another example of biochemical evidence to support cannibalism. Blood residue inside cooking pots indicates that the bone contained some amount of flesh when placed in the pot. While this could also indicate a method of flesh removal for secondary burial it is unlikely due to the random burn patterns indicating an uneven distribution of muscle found on the bones that had been boiled, which can be determined by the presence of pot polish.

### **Site Evidence**

Taphonomic and osteological evidence are extremely important in determining the act of cannibalism in archaeological bone assemblages. Other evidence such as where and in what contexts in the site bone assemblages were found and what was in close physical association is also an indicator of defleshing if not also the act of cannibalism. Site evidence can also give some indication of the type of cannibalism taking place if applicable.

Of all the human bone assemblages analyzed for this paper not one site contained grave goods. This lack of grave goods, a practice very common in the southwest during archaeological times, most likely indicates that these assemblages were not part of a common burial practice. The lack of care and the fact that multiple bodies were dumped together in an unorganized fashion also likely indicates that these assemblages were not a common practice of burial. All bone assemblages were also left unburied when they were discarded. This lack of formal burial indicates cannibalism.

## **Indications**

While the principal criteria needed to identify that cannibalism had in fact occurred are fairly widely accepted, there are few criteria or standardized procedures for how to determine what type of cannibalism occurred at archaeological sites. Based on slight variations in cut marks, burn patterns and fractures that have repeatedly appeared in the archaeological evidence and other site evidence such as how the human bone assemblages were found, conclusions can be made about the type of cannibalism that occurred at archaeological sites and the likely reason(s) behind it.

Survival cannibalism may be the most easily identifiable type of cannibalism due to the drastic nature of the situation. Those who partake in survival cannibalism openly rebel against the cannibalism taboo in favor of staying alive. This contrast between the need to stay alive and partaking in something that is unaccepted in general society leaves distinct characteristics in the bone assemblages. The more disorganized the cut marks are the more likely that the butcher was unskilled and removed the muscles hastily. An individual who butchered a body to stay alive most likely had little experience with butchering a human body and while anatomically it is very similar to other animals the increased stress and reality of butchering a human being would create marks that would be expected to show disorganization. In this situation the individual is most likely starving and would repeatedly return to the carcass, leaving behind disorganized cut marks due to the periodicity of the butchering. This might also reflect the fact that cannibalism is generally a taboo, taking only as much as is necessary each time to limit how much meat is consumed overall. Hesitation marks on the bones are also another indicator that survival cannibalism occurred. Hesitation marks are characterized by multiple short cuts overlying one another, indicating multiple tries before the butcher could make an actual cut mark. Again, with

cannibalism still being viewed as a taboo the person butchering may have had second thoughts about what they were doing, or simply didn't have the ability to butcher another human being during the first few tries. Two other indications that survival cannibalism occurred include the avoidance of the face and the appearance of some attempt at a burial. Human beings are not supposed to eat one another, but as shown here it does occur. By avoiding removing meat from the face, or processing the face at all and focusing on the posterior aspect of the body an individual can avoid looking at the person they are butchering. This can help in removing the butcher from the reality of what he or she is doing to stay alive. Some form of burial, even if it is just a light covering of sediment over the body after consumption, might indicate respect, something that one would expect if the butcher didn't want to use the body for food in the first place. Along with avoiding the face and some form of burial, heavy processing also indicates survival cannibalism (Rautman and Fenton 2005). Bone marrow and grease can supply additional calories and are an important source of nutrients, especially when an individual is desperate which is often the case in survival cannibalism.

Revenge or vengeance cannibalism is the next easiest form of cannibalism to determine at an archaeological site. Revenge cannibalism is violent and destructive and therefore leaves behind the most fractured and destroyed bone assemblages. The butcher is trying to dishonor and degrade the individual he has just killed in battle or out of revenge for something. With revenge cannibalism the victims are more often male, and may contain unhealed wounds from battle or war. Here the individual is not ashamed by the act of cannibalism and may even flaunt the fact that he is consuming an enemy, showing his strength and skill over his victim. Disarticulation of the body into extremely small sections and heavy fracturing are the main indications that revenge cannibalism occurred. Heavy fracturing, especially around the skull shows that the individual

was murdered in a brutal way rather than dying of natural causes. Here, anger and aggression is being taken out on the body consumed; food and nutrition are not the main goals, therefore, there is little care in how much meat is actually removed and consumed. The roasting of disarticulated segments of the body is common, leaving patchy burned sections where meat covered the bone. Marrow and grease extraction are uncommon in this type of cannibalism. While the bones may be fractured in similar ways there is less regularity in where the bones are crushed and fractured. These fractures are unlike the bones that had been processed for marrow or grease. Revenge cannibalism can also be determined from the severe scattering of bones due to lack of respect for the deceased. Feces and urine, which would be recognized by high levels of albuminuria on the bones, may also be found on top of the bone assemblages as another way to degrade and dishonor the deceased.

Ritual or ceremonial cannibalism, while difficult to determine, has a few key characteristics that can help in identify that it occurred. As opposed to revenge cannibalism, here the deceased is being honored and they were highly respected. Consuming the body honors the deceased and is done in a very celebratory manner. There is little evidence of perimortem trauma to the body and, while disarticulation occurs, heavy fracturing and crushing do not. The most diagnostic characteristic of ritual cannibalism is the straight, parallel cut marks found along the sections of bones containing the largest muscle groups. Parallel cut marks indicate that the butcher was skilled and that they were taking their time. With ritual cannibalism the butcher would have been someone highly honored in the community, such as a priest or shaman and would have been highly skilled in the preparation of the body to be consumed. Parallel cut marks also indicate that a great deal of time was taken in preparing the body, which is consistent with ceremonial practices. Another indication of ritual cannibalism is where the bone assemblages are

found. Bone assemblages associated with ritual cannibalism are more likely to be found inside ritual kivas, or rooms that were used for religious activities (Turner and Turner 1994). Although some suggest that the lack of offerings and the scattered, uncared for nature of bones shows that kivas were just dumping sites. However, these religious rooms still indicate that ritual or ceremonial practices were occurring even if we are unable to explain the left over assemblages. These practices could simply be an unstudied ceremony or one that is unknown.

Gustatory cannibalism is by far the hardest to determine. It is not about revenge, ritual or starvation. Here cannibalism is occurring to provide another food source, just as one would consume any other form of animal. Gustatory cannibalism appears as a mix of the above three types of cannibalism, and thus can be overlooked in many archaeological sites because of how closely it resembles the other much more distinct types of cannibalism. Gustatory cannibalism would have a high level of marrow and grease processing because of the nutritional value that is found in these parts of the body. Fractures and crushing would be common, appearing similar to revenge cannibalism, although the fractures and crushing would be in specific areas to obtain the most nutritional value unlike revenge cannibalism. Cut marks would be parallel like ritual cannibalism, although for a different reason. Here parallel cut marks would be due to the skill of butcher and the regularity with which they butcher and prepare both humans and animals for food. Although gustatory cannibalism has similar characteristics to the three other types, the combination of traits is unlike the other three and therefore can be determined as its own type of cannibalism.

## **Implications**

The short-term implications of cannibalism may be as simple as humans doing what they need to do in order to survive under extreme conditions of deprivation no matter what that involves. When put in a life-threatening situation, humans turn to their instincts and natural selection takes over. The stronger prey on the weaker, not only to have more food but also to remove some of the competition for limited resources. However, humans are very different from other animals and, while these short-term implications are rooted in the basic make-up of all animals, the long-term implications of cannibalism for humans are quite different than for other animals.

Long-term implications of cannibalism relate to two important aspects of human life. First, ritual and ceremonial cannibalism focuses on honor and respect for the dead. This type of cannibalism shows a symbolic and emotional side of humans. By consuming their dead, individuals in some cultures believed that the deceased was now a part of them, and that not even death could separate them in the future. Here the body is treated with compassion and respect while modification is occurring and being consumed by the group is a high honor for the deceased. This type of cannibalism is far from taboo and implies that respect is given to members very differently depending on what culture one is from. In this type of cannibalism those who are consumed were likely not killed by members of their own society, but rather died in battle or of natural causes. Ritual or ceremonial cannibalism also implies that humans have evolved symbolic capacities to the point where they are able to view death and the deceased as something and someone meaningful, rather than just another part of life.

In contrast, while still eminently symbolic revenge or vengeance cannibalism shows, or attempts to show, the power one culture or group has over another. Here cannibalism is used to intimidate or scare away another group of people, whether it is to remove competition for resources or land. The more powerful group wins the best resources because other groups are too afraid to face them. Leaders, to hold power over their subjects, can also use revenge cannibalism. Instilling fear, which is what leaders are doing when they use cannibalism as a form of punishment, is a way in which to insure that subjects follow commands. In this case, cannibalism is still looked on as wrong, although it is socially sanctioned when linked to a position of leadership. The deceased here are disposable and killed for the specific purpose of being eaten to intimidate others. Here cannibalism shows a more vicious side of humans.

### **Other possibilities of bone modification**

Many archaeologists have proposed alternate reasons for the modified human bone assemblages that have been excavated, including warfare, witch execution, anatomical or ritual study of the human body and secondary burial preparation, among others (Hurlbut 2000). Some of these alternative ideas are strong possibilities such as warfare and execution of witches, while others lack sufficient evidence to be considered further such as anatomical study of the human body.

Execution of witches is a strong alternative for cannibalism because of the extreme dismemberment and destruction of the bones that has been reported when a culture destroys the body of a witch so there is no longer a body to return to (Ogilvie 2000). Witchcraft is also believed to be heritable in some cultures, which can explain the large age variation seen in bone assemblages (Ogilvie 2000). Entire families may be executed to prevent the spread or practice of

witchcraft. This explanation can explain the burning, cut marks and fractures all found in archaeological bone assemblages. However, it is unable to account for the time that has to be taken to process the marrow and grease, which would unlikely be done if the body was just being destroyed. Witch execution also does not account for the presence of pot polish or the under-representation of vertebra found at most sites (Hurlbut 2000).

Violence and war are also strong alternative explanations for cannibalism, again due to the frequency of bone destruction and damage that would occur on the mutilated bodies. Warfare, however, fails to explain the percussion fractures, pot polish and missing vertebrae. Warfare victims also very rarely exhibit burning. If they do it is normally the result of someone being trapped in a house that was burned down or a prisoner of war being burned at the stake, which would leave very different burn patterns than roasting certain segments over a fire to cook meat or heat marrow. In war burned bodies would experience a lower rate of fractures, especially near areas of high marrow content than burning due to cannibalism. The body parts would also tend to remain in anatomical position and few fractures would be present other than those attributable to combat. Carnivore marks are also very common in violent or warfare assemblages because bodies may remain unburied for an extended period of time (Hurlbut 2000). Most assemblages for which cannibalism has been proposed lack carnivore marks.

While secondary burial can easily explain the disarticulation and defleshing, secondary burials also normally exhibit weathering and carnivore marks. Also there haven't been documented cases of secondary burial that involve perimortem trauma, unhealed wounds or intentional percussion fractures on long bones (Hurlbut 2000). Here again, pot polish isn't accounted for and neither are the burn marks and patterns found on human bone assemblages. The spatial distribution of these remains is also contradictory to what one would expect if the



bodies had been prepared for secondary burial. The scattered, extremely fractured, discarded and unburied bones show little evidence of care, the completely opposite of the patterns one would see in secondary burial, which is about honor and respect for the deceased.

Although postmortem study of the bodies would explain the disarticulation, fractures, missing vertebrae and cut marks it fails to account for the burns, pot polish and any percussion fractures. Most assemblages contain too many bodies and bones are too fractured and scattered to account for postmortem study. Further more, most other cultures that use the deceased to study treat the bodies with great respect and perform proper burials when they are finished.

### **Further questions/research**

Although Turner and Turner and White have set forth a good set of criteria to follow when proposing cannibalism there is still research that can be done to further prove that cannibalism occurred and to further determine the reasons why cannibalism occurred at prehistoric sites. To propose a satisfactory explanation that these modified human bone assemblages at archaeological sites were in fact consumed and not just defleshed and disarticulated further research is extremely important.

The study of biochemical evidence is perhaps the most important research to continue to develop. Once the actual practice of cannibalism can be confirmed to the satisfaction of anthropologists the actual reasons behind consuming flesh can be better focused on, flushed out and determined. The evidence of myoglobin in coprolites is one such biochemical technique that has the potential to be a large player in the determination of cannibalism, if the methods and practices of the one analyzed sample thus far can be fine-tuned, verified and support by other

scientists the use of coprolites has the potential to remove any doubt associated with the label of cannibalism at prehistoric sites.

Along with the advancement of biochemical evidence processing, the use of forensics could possibly cause a large advancement in not only the determination of cannibalism but also the type of cannibalism occurring. Forensic science has the ability to determine the cause and reason behind modern day murders and with the help of archaeologists and forensic anthropologists the same could be done for prehistoric archaeological sites. Along with the use of forensic techniques, it is important to determine human utility indices to help conclude or dismiss survival or nutritional cannibalism as the type of cannibalism occurring. Caribou and other fauna indices have been used in the past, but these are vaguely related and do not give the exactness human indices would.

Further analysis and comparison also needs to be done with ethnographically reported cases of cannibalism and presumed archaeological cases. This comparison would help rule out other causes of the modified bone assemblages and would give insight into the causes and reasons behind various forms of cannibalism. This comparison could also confirm my analysis of the relation between types of modifications and reasons for cannibalism, such as heavy processing of bones, along with a random orientation of cut marks indicating survival cannibalism, where as parallel, organized cut marks may show ritual cannibalism.

## **Conclusion**

While there are many types of cannibalism, and determining which one was the cause of a specific human bone assemblage is far from an easy task, there are indications and evidence left within the bone assemblages if one takes the time to analyze all elements and modifications

of the bones. This determination is by no means an exact method but it has potential in the future to become a common occurrence at cannibalism sites. While, determining that cannibalism actually took place is important, the type of cannibalism occurring is equally, if not more important. It is important to view these assemblages as insight into the culture of societies; maybe it is time to focus on the cultural meanings these assemblages have rather what indicates cannibalism and what doesn't. Certain types of cannibalism, such as ritual, hold fewer stigmas in society than others and this determination can help change the perceptions of the public if presented in the proper way.

This paper has determined that certain characteristics found in bone assemblages in the southwest are attributed to the four main types of cannibalism. Simply stated a bone assemblage that is due to ritual/ceremonial cannibalism would contain very parallel and straight cut marks, there would be little marrow and grease processing and the skull would contain few, if any, fractures. Revenge cannibalism would leave behind a bone assemblage that contains extremely fractured and disarticulated bones. It would also contain bones with unhealed wounds and patchy burn patterns, due to the presence of meat still on the bone when it was roasted. Survival cannibalism would contain bones with disorganized and hesitation cut marks, heavy processing of bone marrow and grease and the avoidance of the face as opposed to the very closely related nutritional or gustatory cannibalism that would have a mix of the other three types. Marrow and grease processing would be present, but cut marks would be parallel. There would be heavy disarticulation and fractures but not to the point of revenge cannibalism.

By determining the type of cannibalism occurring at an archaeological site a lot can be learned about the culture in question. With further study and the help of forensics determining

the type of cannibalism in the future could become much more standardized and common and give archaeologists more information about the site and the culture of the society being studied.

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