

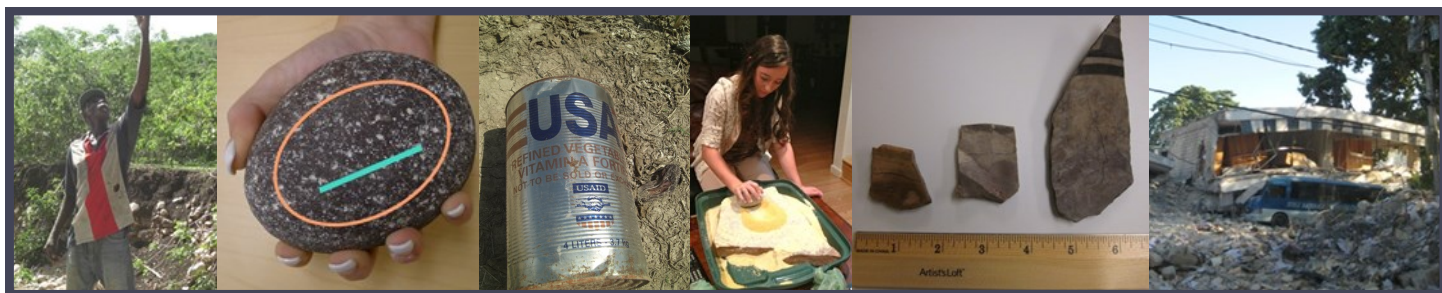
Furthering Perspectives

Anthropological Views of the World

ISSN 0882-4894

VOLUME 6

2013



Pictures Courtesy of authors John McGreevy, Rebecca Simon, and Ashley Packard

ARCHAEOLOGY

Changing Perspectives on Repatriation Christopher Green	3
Use Wear Patterns on Metate Prior to and Immediately Following 20 Hours of Grinding Ashley Packard	12
Understanding the Variation of Rio Grande Ceramics Rebecca Simon	18

BIOLOGICAL ANTHROPOLOGY

Post-Mortem Care Warfare: Can Conflict between Mandated Autopsies and Cultural Expectations for Post-Mortem Body Care be Resolved? Joshua Clementz and Bonnie Glass-Coffin	27
Born to be Wide: A Re-valuation of the Claim that Neandertal Skeletal Morphology Represents a Uniquely Derived Condition Chris Davis	37

CULTURAL ANTHROPOLOGY

First-generation College Attendance: The Motivational Process Scarlett Eisenhauer	47
Haitian Disaster Vulnerability as a Coupled Social-Ecological System John McGreevy	57
Bringing it all Back Home: The Re-localization of Food and its Impacts on Community Resilience Mark Steinbuck	68

2012—2013 OFFICERS AND COMMITTEES ANTHROPOLOGY GRADUATE STUDENT SOCIETY

AGSS Officers

Rebecca Simon, President
Andrea Akers, Vice-President
Laura Manson, Secretary
Virginia Clifton, Treasurer

Volume 6 Editorial Committee

Andrea Akers, Editor-in-Chief
Joshua Clementz, Associate Editor
Michaela Frank, Associate Editor
Chris Green, Associate Editor
Spencer Pelton, Associate Editor
Rebecca Simon, Associate Editor
Mark Steinbuck, Associate Editor

Volume 6 Review Committee

Dr. Jeannette Mobley-Tanaka
Ms. Treloar Tredennick Bower
Dr. Michael Pante
Dr. Lynn Kwiatkowski
Dr. Anne McKibbin
Dr. Peter Hall
Dr. Lori Peek
Ms. Claudia Rosty
Mr. Michael Brydger
Dr. Britney McIlvaine
Ms. Sarah Wycaver

EDITOR-IN-CHIEF'S NOTE

We are proud to announce that Volume 6 marks the first ever completely online publication of *Furthering Perspectives: Anthropological Views of the World* and as such also represents the first year of open source publishing for the journal. The Anthropology Graduate Student Society is dedicated to the success of graduate students in the Anthropology Department at Colorado State University and one avenue of completing this goal is to increase the visibility of the work done by the students in this department. We hope that this journal is a start at accomplishing this goal by publishing the work of both graduate and undergraduate students in the department.

We have a well rounded journal this year with articles ranging from understanding variation in regional ceramics, issues surrounding repatriation, wear patterns on mutates, differences in views towards autopsies, Neandertal skeletal morphology, community resilience, disaster vulnerability, and first generation students.

We appreciate the hard work and dedication of the review committee, editorial committee, AGSS Board, and Authors. Without them *Furthering Perspectives* is not possible.

Here's to many more years to come.

Andrea Akers
Editor-in-Chief

ABOUT THE ANTHROPOLOGY GRADUATE STUDENT SOCIETY

The Anthropology Graduate Student Society (AGSS) promotes scholastic excellence, critical thinking, and a positive educational and social environment for both graduate and undergraduate students. While AGSS is comprised mostly of graduate students, membership is open to all who have an interest in Anthropology. Our purpose is to provide student and community members the opportunity to learn and experience the four subdisciplines of Anthropology: cultural, linguistic, biological, and archaeology.

anthrograd.group@gmail.com

<http://anthropology.colostate.edu/cultural/agss/>



CHANGING PERSPECTIVES ON REPATRIATION

CHRISTOPHER GREEN

ABSTRACT

The Native American Graves Protection and Repatriation Act passed in 1990 in order to protect Native Americans' material culture and the remains of their ancestors. Unfortunately, such legislation reflects the innate cultural disregard in the United States of Native American concerns. Both the laws, such as NAGPRA, and the culture which creates them need to change in order for Native American problems and resolutions to be legitimized by Euro-Americans. Problems with funding, law vocabulary, and entitlement hinder large-scale reconciliation between scientists and Native Americans, and legal battles only worsen the polarization. Beyond the necessary changes needed in NAGPRA to truly protect Native American heritage, deeper cultural changes made by archaeologists in North America are needed to create a harmonious, rather than contentious, working relationship between themselves and Native Americans.

Introduction

The rise of political interest for the protection and repatriation of Native American culture arose out of the "Red Power" movement, parallel and contemporaneous to the African American "Black Power" movement of the 1960's (Seidemann 2004:151-152). Spokespeople and authors, such as Vine Deloria Jr., raised awareness of the economic, political, and cultural Euro-American dominance affecting Native American peoples and tribes. Especially crucial was the effect of science's rising social prominence in the Western world on the Native American community. Science, its methodologies, interests, and goals, were all mostly foreign to Native American peoples who typically had spiritual means for answering the world's questions. This binary opposition was further polarized by the Euro-American hoarding of Native Americans' land, objects, and even human remains by scientists and museums, despite spiritual significance of those objects to the Native Americans. This intrusion was officially, if not practically, stopped in 1990 with the Native American Grave Protection and Repatriation Act. The law meant to "provide for museums and Federal agencies to return certain Native American cultural items...to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian organizations." The law also includes "penalties for noncompliance and illegal trafficking" (NPS.gov, Native American Graves Protection and Repatriation Act).

What NAGPRA does not do, however, is bridge the gap between science and the Native American culture. It only begins to regulate the lawful actions of the Euro-American side of the issue. The real problem lies within a culture in which legislation like NAGPRA is necessary, emphasizing duality. Within this culture, two inherent sub-issues which must be resolved for real progress on

both the scientific and Native sides of the issue. On one hand, American politics and law, such as NAGPRA, are flawed and stagnant, and substantial progress in consideration of both parties' interests needs to be actualized for NAGPRA to achieve the means it sets out to accomplish. On the other hand, rather than administering a law that further polarizes, both culturally and politically, the US government from the Native American nations, science must decriminalize the wants and concerns of the Native Americans and share their own methodologies, interests, and goals in as harmonious and collaborative ways as possible. Despite legislation like NAGPRA, a strong step towards a resolution, the fact that the law was born of the same dominant culture as science implies need for better integration and fusion of interests to address the deeper issues. The legislation is written and voted on by representatives elected largely by non-Natives. In order to effect real and immediate change, archaeologists and scientists must get away from the Euro-centric views and adopt Native American interests fully into their considerations of how they treat and represent the artifacts and people whom they study.

The Scientists

Indo-European peoples' interests in their pasts go back to pre-history. Typically, this interest manifested itself in looting of historically significant sites or justifying power by controlling certain objects or remains. This general enthusiasm for treasure and rare objects began to give way to hoarding by museums in the colonialism period of the eighteenth century. Europeans such as Giovanni Belzoni and Lord Elgin removed many artifacts from cultural hubs such as Rome, Athens, and Turkey to be displayed and pre-

served in large, foreign institutions like the British Museum. Less than a century later, archaeology began to separate itself from antiquarianism, and became more of a scholastic pursuit, equally intent on finding treasures and uncovering hidden truths about their former owners (Greene 2002 2-7). For example, Heinrich Schliemann claimed to discover the "Treasure of Priam" in the early nineteenth century and at the time his work was tremendously influential. Since then, however, the archetype of scholastic pursuit has been discredited after most of his objects have been determined to have come from vastly different periods (Bahn 1996:144-145).

In the late 19th and early 20th centuries, archaeology was dominated by an educated and aristocratic elite. This lofty, scholarly pursuit had its roots in the Victorian elite's interest in antiquarianism. Unfortunately, adding academia to antiquarianism only made it that much more inaccessible to the general public or even to the natives whose ancestors were the subjects of the studies (Greene 2002:3-5). This introduced a long-standing culture of incongruity between the archaeologists and any other people affected by their work.

Only in the mid-20th century would archaeology become widely known in academia as the mostly honest and scholastic pursuit of knowledge. Despite variability in the discipline, typically archaeology is understood as an attempt to find out what, why, and how things happened in the past based on physical evidence. Historical records give first-hand or hear-say information of the past, but artifacts, features, and sites give hard data from which archaeologists build their interpretations. Understanding and preserving material culture also helps people to understand different cultures and their ideals, and in theory, manifests universal understanding and respect of different cultures and beliefs. In a perfect world, this might even help eliminate ignorance and hate manifested in ideas like racism.

In a humanitarian capacity, archaeology has battled racism when faced with intense popular issues, such as post-World War II Germany and post-slavery United States. Archaeological projects, such as undertaken in Israel by Yigael Yadin and Yohanan Aharoni (El-Haj 2002), delved into the everyday lives of those facing discrimination, finding evidence of the same normalcy, creativity, and intelligence as can be found for any other race (Jones, Sian 1997:8). Recent archaeological projects meant to undermine racism in Israel (Masalha 2007:135-165) and South America (Curtoni 2006:93-95) operated under the auspices of "People of Earth" movement created by the United Nations as an attempt to create

value for indigenous cultural heritage (Politis 2011:514-516). These projects represent the burgeoning field of ethnic archaeology, which strives to understand racial dynamics of the past and why they formed. Ethnic archaeology looks beyond modern misconceptions and to the root of the problematic identities buried in the unseen past (Jones, Sian 1997:135-144).

One of the most famous cases of an ethnic archaeological excavation is the work by Gertrude Caton-Thompson at Great Zimbabwe in 1929. At its "discovery" in 1871 by German geologist Karl Mauch, scientists interpreted the impressive site as constructed by Europeans, Phoenicians, or even the Queen of Sheba (Brown 1994:3-8). The site consists of expansive and complex stone buildings and walls with no equivalent known at the time to exist throughout Africa. The European explorers that saw modern Africans living in small mud-huts with little or no political organization assumed that such a great work could not have been achieved by the African people, or in some cases, by black peoples at all. Mauch wrote in his journal just after the discovery of Great Zimbabwe that it "could never have been built by Blacks" (Brown 1994:8). Caton-Thompson's work, however, concluded that all the evidence indicated the indigenous, black Shona peoples constructed and inhabited the site (Bahn 1996:176). Such an objective interpretation serves to benefit society in opposing any logical or scientific justification for derogatory beliefs or actions.

Unfortunately, this is not an ethics of archaeology paper in which these things could be discussed at greater length. It is important to note, however, that where there is influence, there is potential for misuse of that influence. Archaeology has been used to justify and maintain racist ideas much longer than it has been used to destroy them. Even at Great Zimbabwe, there were three excavations by three separate archaeologists before they came to an objective and realistic conclusion based on the evidence. In 1891, the Prime Minister of South Africa hired J. Theodore Bent, an antiquarian, to prove that Great Zimbabwe was built by the Phoenicians and inhabited by King Solomon and the Queen of Sheba. It seemed as if the evidence only pointed back towards the black peoples of the area, but Bent declared that the structures were not associated with any *known* African people (Bahn 1996:176). The curator of the site from 1902-1904, Richard Hall, made more deliberate attempts at controlling the racial record. He cleared out as much as 12 feet of archaeological deposits on the site, ruining or selling a large portion of valuable artifacts he deemed irrelevant to the cause of establishing non-black

construction and inhabitation. These actions prompted his dismissal and another archaeological investigation, which again proved inconclusive and allowed the common racism to thrive (Bahn 1996:176-177). Nearly 60 years after its discovery, Caton-Thompson proved otherwise, and by that time a racist culture was settled and comfortable. Archaeology's destructive and manipulative nature facilitated the expansion and solidification of these racist sentiments, and even re-discovery and new findings could not replace the entrenched racist culture.

The lack of understanding or concern with the general public's interests in the objects of archaeologists' study is an issue that many maintain persists even today. The controversy surrounding the find, called Seahenge, exemplifies this type of academic negligence. A small circle made of wood planks with an upturned stump in the center, Seahenge was found on the shore of Britain after the peat protecting it had been washed away (BBC News, "Seahenge Gives Up its Secrets"). Archaeologists concerned that the newly exposed wood would quickly erode away after being exposed to the elements were compelled to excavate and salvage the unique site. Environmentalists, concerned about the site sitting in the middle of the nature preserve were ultimately concerned for the delicate wildlife in the area and demanded that all people stay away from the new find. One environmentalist concerned with the damage excavation or pilgrimage would create claimed to BBC News, "The only way to save the site is to rid us of the circle." Additionally, the Neo-Druids claimed, along with some neighboring townspeople, that the location was religiously significant, and according to their beliefs, the site should remain untouched and subject to the elements.

Archaeologists, with the help of English Heritage and the government, disregarded the other considerations and excavated despite massive protests. The extreme urgency of the situation and enduring archaeological importance of the site took precedence over the spiritual or extant concerns of others, seemingly without much apprehension. Speaking about the public backlash regarding the excavation, an inspector for English Heritage Philip Walker said, "Archaeologists don't tend to get involved in discussions with parish councils ... we were surprised to find so much passion aroused by the circle" (Moreton, "Druids Rally for Battle of Seahenge"). For both the Druids and the environmentalists, the effect of the archaeological work completely disregarded their interests without compromise. This type of indifference to what may be seen as ephemeral or irrelevant concerns

compared to what scientists may consider their own ageless understanding represents a significant cultural disparity between the public and academic interests.

The same disregard is also evident in North American archaeology. In any discussion of NAGPRA, the Kennewick man is typically the central figure. The Kennewick Man, found in Washington state in 1996, is the most complete Paleo-Indian skeleton ever found to-date. The remains were first interpreted as recent, due to their completeness and Caucasoid features (Thomas 2001:114). Further study and radio-carbon dating associated the remains with Paleo-Indians from about 9,200 years ago (Seidemann 2004:154). The organization that controlled the remains, the U.S. Army Corp of Engineers, immediately made a repatriation request to find claims for cultural affiliation. This process came to a halt; however, when many prominent physical anthropologists called for further study, citing the need to realize the remains full academic potential before their repatriation. When five tribes banded together in a repatriation claim with the intention of reburial of the remains, the issue was settled in court in *Bonnichsen vs. the United States* (Fine-Dare 2002:151).

Eventually the claim for repatriation was defeated, as was its appeal, due to the fact that the remains were so old that it was impossible to tell whether they were culturally affiliated with a specific tribe (Jones, Peter N. 2005:28-30). After losing the appeal, the Native Americans no longer had any claim to the remains, nor any say in their treatment. Studies continued since the end of the legal battle in 2004, but have done so without any published information regarding the studies. Recently, Doug Owsley, a forensic anthropologist from the Smithsonian Institution, held a conference discussing the most recent findings regarding the Kennewick Man (King, "Kennewick Man was all Beefcake"). Currently, the Burke Museum of Natural History and Culture at the University of Washington holds the remains, as dictated by the ruling (Washington.edu, "Kennewick Man – Burke Museum").

The Native Americans

Native Americans' sentiments regarding human remains are generally simple. As George H.J. Adams, a Seneca and museum director, stated:

The American Indian community has argued that the remains of our ancestors could not be held legitimately or morally by institutions under any circumstances and should be reburied in a culturally appropriate manner by the appropriate religious body of a specific tribal group. For many Indian people, the position that scien-

tific study needs to be conducted on these osteological materials does not carry much weight....If individuals of good will from the Indian community and scholars continue to enter into a positive dialogue on issues relevant to repatriation, we may eventually achieve an accommodation where both science and the interests of the native community can be served.

Washington.edu, Kennewick Man – Burke Museum

Many tribes are open to more collaborative approaches to North American archaeology and museum studies. However, regardless of the process and findings of what NAGPRA considers “cultural affiliation” or potential scientific value for human remains, the Native American community believes that no remains should be held by Euro-American scientific institutions.

To lump all Native Americans under one generalization is certainly inappropriate, but it may be said that for many tribes the continuity of the circle is considered sacred to many different tribes (Bruchac 2003:10-11). The greatest cycle of all, life, was represented by the medicine wheel in many central and western tribes’ religions. Accordingly, many objects and structures that were important to tribes took shape in a circle: drums, hogans, kivas, tipis, dream catchers, and medicine wheels (Bruchac 1993:79-80).

Another example of the importance of circles can be found around the Bad Pass Trail along the Bighorn Canyon in Montana and Wyoming. At these sites, many stone circles are found, and while many of them proved to be for habitation – indicating they are tipi-rings – many other circles do not seem to have been lived in (NPS “Documenting Tipi Rings”). Many Native Americans claim that these circles are sacred, and were used for dance or song rituals, and that they should not be archaeologically disturbed. Archaeologists in the Great Plains have had to tip-toe around this issue, especially because of NAGPRA.

The interconnectedness and dependence that circles represent is also reflected in their beliefs of the afterlife. There is an ardent respect for the spiritual aspect of Native American ancestors. It is the living’s obligation to keep the ancestors comfortable, and also secure their own legacy in the greater ancestral circle. To maintain a healthy ancestral circle though, the circle must be undisturbed. In cases which Native Americans believe their ancestors are being disturbed, it is a profoundly disruptive occurrence (Bruchac 1993:79-80).

This general characterization of some Native American beliefs serves to outline the distinction between native beliefs and the cultural juxtaposition it poses to Judeo-Christian Euro-Americans, the culture within academia is entrenched. In accordance with their beliefs,

Native Americans have pushed for legislation protecting them, which resulted in acts such as NAGPRA and AIRFA. Though to accomplish their means, Native Americans must use the stipulations and vocabulary provided by the United States legal system. Unfortunately, the means and even the law itself are not sound enough to bridge any gap between Euro-American culture and that of the Native Americans.

The Law

The nature of the U.S. legal system is meant to protect everyone from impropriety and injustice. It is common knowledge that it does not do this as effectively as law makers and enforcers would like to claim, but the failings of the law go even further in regards to Native Americans. As the law is created out of the US government’s legal system, it is Euro-centric and unfortunately, tends to favor Euro-American ideals. The legislation written and enacted by a Euro-American government tends to give the Euro-Americans the benefit of the doubt, and forces Native Americans to go out of their way to make successful claims. Under NAGPRA, museums are required to make public inventories and cultural identification reports of NAGPRA pertinent objects. On the other hand, artifacts do not have to be repatriated unless they are claimed by a federally recognized Native American tribe. In cases where remains are held or displayed in areas far from their homeland, these remains can be tough to locate or repatriate. Often there is little organization or funding which Native Americans might utilize to make claims; museums in some instances have disregarded evidence in order to justify their labeling the remains “culturally unidentifiable” (Niesel 2011:2)

The glaring issues that typically stand out to naysayers of NAGPRA lie in the technical wording. Native Americans and archaeologists alike scrutinize terms used in NAGPRA, such as “cultural affiliation” (Thomas 2000:225-238). This abstract term demonstrates the ambiguous nature of the law and its regulations. The law does not cater to archaeologists or Native Americans, but only to itself and those that are trained to interpret it. It was created out of the vocabulary of law rather than the vocabulary of those stakeholders in the issue. As such, a third party has been introduced to this equation: the lawyers. Necessitating this third party to mediate any dispute between archaeologists or museums and Native Americans only furthers polarization.

In a case brought to the NAGPRA Review Committee regarding the possessions of the New York State Museum, the Onandaga Nation made a claim that the

remains of over 100 bodies that were in the possession of the museum were their ancestors (NPS.gov, "New York State Museum"). The museum completed its inventory and determined that the entirety of the remains were unidentifiable. According to NAGPRA, the way of determining "cultural affiliation" was by using a "preponderance of evidence" and is ultimately determined by the institution currently with control over the remains – the museum. The Native Americans claimed that their presentation of evidence to the museum qualified as a "preponderance." The museum claimed it was not (NPS.gov, "New York State Museum").

The NAGPRA Review Committee found in favor of the Onondaga Nation and demanded the repatriation of all 180 remains. The nature of this dispute demonstrates the balance of power as it situates within NAGPRA. In the end, it was the museum that was illegally holding human remains, but the museum is naturally protected by the law. NAGPRA only mandates that museums make a "good faith effort" to complete their inventories accurately and effectively (NPS.gov, Native American Graves Protection and Repatriation Act). In cases where large institutions, such as the Smithsonian, are unable to complete their inventories on-time purely based on sheer quantity, this vocabulary may be acceptable. The room that it leaves for smaller institutions to hide behind is the problem. In fact, when disparities were found in the National Park Service's spending of NAGPRA money, the Government Accountability Office was assigned to investigate. Their findings, published in 2010, found that the National Park Service was allowing institutions to withdraw their notification lists of Native American human remains (Indigenouspeoplesissues.com, "Indigenous Peoples' Issues and Resources"). Essentially, museums are not held accountable except by the tribes that are able to make claims, and unfortunately not all, nor even most, Native American tribes can make and complete claims for ancestors' remains held by these institutions due to a woeful lack of resources.

In 1999, the president of the Society for American Archaeology, Keith W. Kintigh, wrote a letter to the Senate Committee on Indian Affairs regarding the issues with NAGPRA. One of the most glaring, he pointed out, was the lack of funding to accomplish the goals of the bill.

The most common and most serious complaints about the NAGPRA coordination function, including those voiced by the Review Committee, tribes, and museums, are a direct consequence of inadequate staffing and funding; they are not due to the location within NPS. Without additional funding, the DCA (Departmental

Consulting Archeologist) simply cannot satisfy all of the responsibilities assigned by the Secretary in a timely way (saa.org).

In 1999, about 2.2 million dollars were spent on implementing NAGPRA, according to the National Park Service's website.

In 2008, many small changes were made to the law which necessitated additional funding in association with the law. Most importantly, the wording has been changed from "cultural affiliation" to "cultural relationships", underscoring the importance of a perceived relationship, despite a possible lack of scientific evidence (World Archaeological Congress.org). This change afforded Native Americans to make "disposition" claims for remains without evidence of cultural affiliation with the tribe, but have enough historical, mythological, and geographical connection to transfer possession from the museum to the tribe. This change was apparently made in direct response to the Kennewick Man controversy in order to empower tribes with seemingly tenuous claims.

In accordance with the projected spike of interest in repatriation and disposition claims, the NAGPRA Review Committee requested 4.1 million dollars in grant money for the fiscal year, up from the 2.3 million that it had seen the years previous. The next year the committee was given its typical 2.3 million, but in early 2010, the budget was cut to 1.7 million. After losing over 500,000 dollars, the committee appealed to Congress that it would be impossible to maintain the law without an increase to the afore-requested amount of 4.1 million dollars (Trimble). Later in 2010, the GAO determined that not all institutions were complying with NAGPRA, but no changes were made to force accountability, and as of January 2013, there are no plans to increase the funding.

This funding deficiency not only incentivizes non-compliance from museums, but does not appropriately empower under-resourced tribes to utilize NAGPRA. According to the 2000 U.S. Census, over 25 percent of Native Americans live in poverty compared to 12 percent of all Americans. The median family income per year for Native Americans tops out at just above 33,000 dollars, compared to over 51,000 dollars for the average American family. These statistics are bolstered by people who claim Native American heritage without living on a Native American reservation. On reservations, like the Blackfeet Reservation in Montana on which over 8,500 people live, poverty rates are much closer to 50 percent. This lack of money and opportunity for Native American tribes as an entity provides little in the way of repatriation efforts or battles with U.S. law. Museums like the Marjorie Barrick

Museum in Nevada stipulate that “costs for transporting objects or other costs associated with repatriation are the responsibility of the tribe” (barrickmuseum.unlv.edu). Beyond reforming many Native American issues, the only thing the government can do to help is provide them with grant money in order to protect the remains or objects important to them, but that money seems to be dwindling as well.

Euro-American Bias

It's very tough to address the injustices of the Native Americans without at least touching upon the atrocities that came with Euro-American expansion. It can be argued that it is in the past and that any past transgressions are irrelevant in consideration of what must be done to correct the present. This, again, seems to be a very Euro-centric line of thought. It is as important to consider the past of the Native Americans and how characters like Andrew Jackson and George Custer interacted with them as it is to discuss how those same characters created a nationalistic identity for the United States. This selective history and selective relevance undermines the basic notion that the Native Americans *were* wronged. Not only were they, but they still are today; by undermining a history that has helped establish disparate modern living conditions and opportunities, very little progress can be made now in correcting many of the issues that plight the Native American communities today.

Consideration must be taken into account of the United States' wrongdoings and the subsequent effect that it had on the Native American worldview. The Euro-American power over Native American culture, land, and identities has inspired a defensive posture from Natives in regard to these issues. For Natives, protecting their heritage and their beliefs has very little to do with the past and most everything to do with the present. Despite Natives efforts on their own behalf, the typical American is very unwilling to adhere to any possible discomfort for the benefit of Native Americans (Noll 2). As such, it is not out of place that Native Americans would demand control over their own heritage, regardless of other interests in it.

Much of the “Red Power” movement of the 1960's revolved around the concept that science is not, in fact, superior to traditional views of Native Americans (Deloria 91). NAGPRA attempted to legitimize traditional knowledge relative to scientific knowledge when folklore and oral tradition were included amongst the criteria for making cultural affiliation. The Kennewick Man case set a precedent contradicting the law when scientific criteria were favored over traditional knowledge. Modern archae-

ologists come from a culture that has idealized the artifacts and knowledge associated with them more so than the people that it actually concerned. This sentiment has manifested itself in the biases of archaeologists and scientists regarding Native Americans' objects and remains. The legal precedent has now validated this bias in *Bonnischen v. the United States*.

Due to the backlash surrounding Kennewick Man and other similar finds, a new NAGPRA regulation was passed in 2010 giving Native Americans wider claims on objects held in museums or found by archaeologists, especially those considered “culturally unidentifiable” (World Archaeological Congress.org, “Proposed US Federal Rule Reaffirms the Importance of NAGPRA”). This has corrected parts of the law, which clearly favored Euro-American concerns, but it hasn't affected the cultural problems which were the cause of the flawed law. Realistically, the culture in the United States is moving towards equality for all people, including Native Americans, in which case people may find it an issue hardly worth talking about. But considering the degree to which Native Americans must fight to preserve their modern culture and its values, the issue is time sensitive.

Conclusion

Consciousness of the issue and the repercussions of ignorance or bias is the simple answer to this problem. Politicians must be aware and sympathetic to Native American concerns, in which case people must be aware to hold the politicians accountable. Unfortunately, the lack of knowledge and interest in Native American issues by the general population of the United States is the cause for the lack of accountability for politicians, government services, and even the law itself. According to the U.S. Census, the Native American population makes up only 1.0% of the United States population, with a majority of those people isolated from the general public on tribal reservations. Awareness of the injustice and universal empathy for Native Americans is the easiest answer, and that being said, there are some ways that scientists can bridge the gap and bring Native Americans into the academic and general consciousness.

A huge selling point for NAGPRA for archaeologists was “that NAGPRA was a legislative compromise intended to balance the legitimate concerns of American Indians and Native Hawaiians with the interests of the scientific community... in our shared American heritage” (Kintigh). Archaeologists perceived that acquiescing to Native American ideals would largely eliminate the field of archaeology in the United States. Unfortunately, this senti-

ment is a strong example of the entitlement and disregard of Euro-Americans and positivism, but the concern was prevalent leading up to the passing of NAGPRA. The misconception upon which these thoughts are based is that Native Americans dislike or disregard science when, in fact, many Native Americans work in all different fields of science, including archaeology. There are at least seven large tribes that now run their own historic preservation programs, as well as many others that operate their own CRM firms (Ferguson, 69). The Bannock-Shoshone, the Catawba, the Chugach, the Dakota, the Kodiak Area Native Association, the Narragansetts, the Mashantucket Pequot, and the Northern Cheyenne and Crow have all been known to work with Euro-American archaeologists to manage cultural resources or undertake archaeological research. There are even several tribes that have worked with archaeologists to create museums with accurate representations of the tribes and their ancestors, from both scientists and the Native Americans themselves.

This type of collaboration is necessary to bridge the cultural gap between scientists and Native Americans. By introducing the appropriate Native American peoples to their work, archaeologists can get informed opinions relating the probable use of, and proper handling of artifacts. In that same way, Native Americans should be involved in the consultation process regarding the caretaking of culturally unidentified remains, such as the Kennewick Man. In this case, after the Kennewick Man's appeal was won by the physical anthropologists, the remains were taken from the Native Americans and placed in the Burke Museum of Natural History and Culture at the University of Washington (Washington.edu). As such, he is handled and cared for by Euro-Americans and scientists. It would make sense to include the people that fought so hard to repatriate him in the caretaking process, in which case to a certain degree both sides would win. Instead, in instances like Kennewick Man and others that have not been repatriated, their care is left to foreigners who seemingly have little to no appreciation for Native American spirituality.

On the other end of the spectrum, a fantastic program, rendered by Northern Arizona University, has recently offered work-study opportunities in which Navajo and Hopi tribe members of the area can "earn income and gain experience while pursuing undergraduate and graduate degrees in anthropology and related fields" (Ferguson, 69). These types of programs will bring Native Americans to the forefront of the study of their own ancestry, and further involved with Euro-American scientists. Programs such as these, as well as proper gov-

ernment-led incentives for museums will help to bridge the gap. The less grant money the government offers, though, the less willing museums will be to reach out in the midst of losing important collections. The government has to legitimize its own laws, such as NAGPRA, by granting them the necessary funds, otherwise they are empty reminders of broken promises and indifference towards the Native American community.

NAGPRA is a necessary law that provides a means for Native Americans to reacquire much of what has been taken from them; however, as a Euro-centric law, protection often falls on those that don't necessarily require it. Changes, such as the recent one that allows for wider Native American claims, prove that the United States is moving in the right direction. More emphasis should be placed, though, on the culture that has allowed this gross negligence and flawed legislation to thrive. North American archaeologists need to take it upon themselves to fully integrate themselves with the wants and concerns of Native Americans to create a new academic and understanding culture between science and Native American beliefs, rather than using the already comfortable and biased cultural gap to accomplish their means.

References

- U.S. Census Bureau
N.d. "American FactFinder: Census 2000 Demographic Highlights / American Indian and Alaska Native alone or in combination with one or more other races." <factfinder.census.gov/servlet/SAFFIteratedFacts?_event=&geo_id=01000US&geoContext=01000US&street=&county=&cityTown=&state=&zip=&lang=en&sse=on&ActiveGeoDiv=&useEV=&pctxt=fph&pgsl=010&submenuId=factsheet_2&ds_name=DEC_2000_SAFF&ci_nbr=009&q_rnam>. Accessed Jan. 3, 2011.
- Census.gov
N.d. "American Indian Reservations and Trust Lands." <www.census.gov/geo/www/ezstate/airpov.pdf>. Accessed Jan. 3, 2011.
- BBC News
1999 BBC News, July 8. "Seahenge Gives Up its Secrets." BBC News | Sci/Tech. N.p., <<http://news.bbc.co.uk/2/hi/science/nature/388988.stm>>. Accessed Dec. 18 2010.
2008 BBC News, March 25 "Ancient Seahenge 'Returns Home'." BBC NEWS | UK. N.p., <http://news.bbc.co.uk/2/hi/uk_news/england/7312429.stm>. Accessed Dec. 18, 2010.
- Bahn, Paul G.
1996 The Cambridge Illustrated History of Archaeology. Cambridge: Cambridge University Press.
- Brown, Dale
1994 Africa's Glorious Legacy. Alexandria, Va.: Time-Life Books.
- Bruchac, Joseph
2003 Our Stories Remember: American Indian History, Culture, and Values Through Storytelling. Golden, Colo.: Fulcrum Publishing.

- Bruchac, Joseph and Diana Landau, eds.
1993 *Singing of Earth: A Native American Anthology*. Florence, Ky.: The Nature Company.
- Curtoni, Rafael P., and Gustavo G. Politis
2006 "Race and Racism in South American Archaeology." *World Archaeology* 38.1: 93-108. JSTOR. Accessed Dec. 5, 2010.
- Dare, Kathleen S.
2002 "NAGPRA as a Cultural and Legal Product." *Grave Injustice: The American Indian Repatriation Movement and NAGPRA*. Lincoln: University of Nebraska Press. 139-171.
- Deloria, Vine
2003 *God Is Red: A Native View of Religion*. 30th Anniversary Edition ed. Golden, Colo.: Fulcrum Pub.
- Doughton, Sandi
2006 *The Seattle Times*, Feb. 24. "Kennewick Man Yields More Secrets" <http://seattletimes.nwsourc.com/html/localnews/2002825565_kennewick24m.html>. Accessed Dec. 18, 2010.
- El-Haj, Nadia Abu
2001 "Archaeology and National Identity in Israel." *Facts on the Ground: Archaeological Practice and Territorial Self-fashioning in Israeli Society*. 99-105. Chicago: The University of Chicago Press.
- Ferguson, T.J.
1996 "Native Americans and the Practice of Archaeology." *Review of Anthropology* 25: 63-79.
- Gosden, Chris
2006 "Race and Racism in Archaeology: Introduction." *World Archaeology* 38.1: 1-7. JSTOR. Accessed Dec. 5, 2010.
- Greene, Kevin
2002 *Archaeology: An Introduction*. University of Pennsylvania Press.
- Indigenous Peoples Issues and Resources
2010 *Indigenous Peoples Issues and Resources*, Aug. 19. "National NAGPRA Ineffective In Some Cases; Federal Agencies Fail To Comply With Law To Return Indigenous Remains, Cite Analysts In GAO Report." N.p. <http://indigenouspeoplesissues.com/index.php?option=com_content&view=article&id=6335:national-nagpra-ineffective-in-some-cases-federal-agencies-fail-to-comply-with-law-to-return-indigenous-remains-cite-analysts-in-gao-report&catid=52:north-america-indigen>. Accessed Jan. 3 2011.
- Jones, Peter N.
2005 *Respect for the Ancestors: American Indian Cultural Affiliation in the American West*. Boulder, Colo.: Bal`uu Institute Press.
- Jones, Sian
1997 *The Archaeology of Ethnicity: Constructing Identities in the Past and Present*. London: Routledge.
- University of Washington
N.d. "Kennewick Man - Burke Museum." N.p. <<http://www.washington.edu/burkemuseum/kman/>>. Accessed Jan. 3 2011.
- King, Anna
2012 National Public Radio, Oct. 12. "Prehistoric 'Kennewick Man' Was All Beefcake" NPR : News. <http://www.npr.org/2012/10/12/1627953kennewick-man-was-all-beefcake>. Accessed Jan. 2 2013.
- Kintigh, Keith W.
1999 *Society for American Archaeology*, April 20. "Critical Issues: NAGPRA." <<http://www.saa.org/AbouttheSociety/GovernmentAffairs/RepatriationIssues/CriticalIssuesNAGPRASStatement/tabid/221/Default.aspx>>. Accessed Dec. 17, 2010.
- Little, Barbara
N.d. NPS Archeology Programs. "Archeology and Civic Engagement." N.p. <www.nps.gov/archeology/PUBS/techbr/tch23.htm>. Accessed Dec. 17, 2010.
- Masalha, Nur
2006 "From Secularism to Messianism: Theology and Geopolitics of Neo-Zionism, 1967-2006." *The Bible and Zionism: Invented Traditions, Archaeology and Post-colonialism in Palestine-Israel*. London: Zed Books. 135-164. Print.
- Meighan, Clement W., and Larry J. Zimmerman
1999 *Archaeology Magazine*, Feb. 26. "Native Americans and Archaeologists." *Debating NAGPRA's Effects*. <http://www.archaeology.org/online/features/native/debate.html>. Accessed Dec. 15, 2010.
- Moreton, Cole
1999 *The Independent*, June 27. "Druids Rally for Battle of Seahenge" <<http://www.independent.co.uk/life-style/druids-rally-for-battle-of-seahenge-1102725.html>>. Accessed Jan. 18, 2011.
- National Park Service
2008 *Native American Graves Protection and Repatriation Review Committee Findings and Recommendations Regarding Cultural Items in the Possession of the New York State Museum*. Department of the Interior, NAGPRA Review Committee. March 4, 2009. Accessed Dec. 16, 2010. <<http://www.nps.gov/nagpra/REVIEW/INDEX.HTM>>
- National Park Service
1990 *Native American Graves and Repatriation Act*. Pub. Law 101-601. http://www.cr.nps.gov/local-law/FHPL_NAGPRA.pdf
- National Park Service
N.d. "Documenting Tipi Rings along the Bad Pass Trail, Bighorn Canyon NRA." NPS Archeology Program: Research in the Parks. N.p. <<http://www.nps.gov/archeology/sites/npsites/bighornCanyon.htm>> Accessed Dec. 30, 2010.
- Niesel, Zoe E.
2011 *Wake Forest Law Review*, Oct. 20. "Better Late Than Never? The Effect of the Native American Graves Protection and Repatriation Act's 2010 Regulations." *46 Wake Forest L. Rev.* 837 (2011): 837-865. Print.
- Noll, Christina.
2009 *Helium*, Oct. 29. "Racism Against Native Americans." N.p. <<http://www.helium.com/items/1394215-racism-on-native-american-people>>. Accessed Dec. 30, 2012.

Politis, Gustavo G., and Rafael Pedro Curtoni

2011 "Archaeology and Politics of Argentine During the Last 50 Years." *Comparative Archaeologies: A Sociological View of the Science of the Past*. L.R. Lozny, (Ed.) 495-525 New York: Springer. Print.

World Archaeological Congress

2007 World Archaeological Congress, Dec. 16. "Proposed US Federal Rule Reaffirms the Importance of NAGPRA." N.p. <http://www.worldarchaeologicalcongress.org/site/news_pres_22.php>. Accessed Jan. 3, 2011.

Seidemann, Ryan M.

2004 "Time For A Change? The Kennewick Man Case and its Implications for the Future of the Native American Graves and Repatriation Act." *West Virginia Law Review* 106: 149-176. Time For A Change?. Accessed Dec. 15, 2010.

Smith, Sammy

2010 *Society for Georgia Archaeology*, Oct. 29. "What is NAGPRA?" N.p. <<http://thesga.org/2010/03/what-is-nagpra/>>. Accessed Jan. 3, 2011.

Thomas, David Hurst

2000 "The Perilous Idea of Race" & "Tribal Affiliation and Sovereignty." *Skull Wars: Kennewick Man, Archaeology, and the Battle for Native American Identity*. 102-122 & 225-238. New York, N.Y.: Basic Books. Print.

Trimble, Charles

2010 *Indian Country Today*, Feb. 7. "NAGPRA Suffers Surprising Proposed Budget Cut." N.p. <<http://www.indiancountrytoday.com/home/content/83643187.html>>. Accessed Dec. 20, 2010.

USE WEAR PATTERNS ON METATE PRIOR TO AND IMMEDIATELY FOLLOWING TWENTY HOURS OF GRINDING

ASHLEY PACKARD

ABSTRACT

Ground stone is rock that has been modified with the purpose of crushing and grinding. It is most commonly associated with processing plant material (Stone 1994). This experiment was designed to address how much use-wear could be put on a metate after 20 hours of grinding pine nuts and millet. To determine use wear, 50 test subjects measured the coarseness of the metate before and after grinding against six grits of sand paper. To quantify the amount of abrasive particles per square inch on the metate, a scale of sandpaper grits varying from coarse to extra fine was developed. This method of measurement will allow future archaeologists to compare experimental results obtained from grinding to ground stone assemblages in order to determine the amount of time each artifact was ground on.

Introduction

Raw material type, shape, size, use, and maintenance are all taken into consideration when selecting a metate (Adams 1993 and Mauldin 1993). Over time, Native Americans made improvements to ground stone technology. These advancements allowed for higher grinding efficiency, increased return rate for the energy invested into grinding, and greater control over use-wear patterning. Factors influencing these changes in technology include raw material availability, new knowledge on tool design, and the discovery of more ways to process food (Adams 1993).

Three transitions have been observed in the evolution of ground stone technology. The original metate was a flat slab with a slightly depressed surface. The hand stone left a depression in the metate through a circular grinding motion. This is called a basin ground stone. Next came the troughed metate that had an established groove running down its center. This was done purposefully by grinding with a hand stone whose length was shorter than the width of the metate. Finally, a metate that was completely flat emerged. This type of metate was able to retain its flat surface because the hand stone being used on it was the same length as the width of the grinding surface. As the hand stone moved across the metate surface, its sides did not cause a use-wear depression to form (Morris 1990 and Adams 1993).

With the transition from basin, to troughed, and then flat ground stone surfaces, there is an increase in surface area being used for grinding. This makes a ground stone much more efficient at processing plant material for food. Efficiency is the energy invested into grinding. Larger surfaces, or bigger metates, would have

allowed food to be processed at a faster rate, therefore making grinding more energetically efficient. However, it must be understood that a tool can only become so large before it requires more energy, in the form of a person's strength and endurance, to use than it can return (Adams 1993 and Mauldin 1993).

Grinding intensity, on the other hand, is the amount of time spent grinding. A metate used for two hours straight has been more intensely used than a metate used for two separate one-hour sessions. Although the size of the metate does not influence how intensely it may be used, human strength and endurance do come into play. Evaluating the use-wear patterns on a metate surface can lead to conclusions about how intensely or efficiently prehistoric people have used it in the past (Adams 1993).

If a flat metate has the most potential to be used efficiently and intensively, why was it not adopted immediately all over the Great Plains? A possible explanation for this could be that different types of grinding technologies may have been appropriate for grinding different foods. Or, individual preference for a specific grinding technology and the desire to continue using practiced grinding techniques was more important to some prehistoric people. However, the prospect of improving the efficiency and intensity of grinding, in addition to the potential for managing wear more effectively, led to the integration of the flat metate into prehistoric village life (Adams 1993).

Hopi women have been observed using two different grinding strokes when processing food. Both are performed with the metate tipped slightly away from the grinder. The first stroke starts with the proximal side

of the hand stone exerting pressure down the metate away from the grinder while the distal end is held away from the surface. The hand stone is then tilted so that the distal end is in contact exerting pressure on the return stroke back towards the grinder while the proximal end is held away from the metate. This type of stroke causes more wear to occur on the proximal side of the hand stone. To keep the use wear on the hand stone even on both sides, the grinder occasionally rotates the hand stone so that the proximal and distal ends are switched. However, triangular wear still results despite rotation. This type of use wear is known as a keel. It keeps the grinder's fingers from brushing against the metate's surface during grinding (Morris 1990 and Adams 1993).

The second stroke holds the hand stone flat against the metate surface. Since the hand stone is not tilted back and forth from the proximal to distal end, only the proximal part of the hand stone is worn down. In order to keep the wear even, the hand stone is occasionally rotated so that the proximal end becomes the distal end. As a result, the flat surface of the hand stone is maintained. At some point, the hand stone will become so thin that the grinder's fingers begin to scrape along the metate while pressure is being exerted during grinding. It is at this point that the hand stone is considered completely worn. Both types of grinding strokes exist as management methods to prolong the use-life of the hand stone being used for grinding (Adams 1993).

If prehistoric people had not practiced either one of these grinding techniques they could have instead wore down one side of the hand stone then flipped it over to its opposite side where a brand new sharpened surface would be available for use. Conscious management of hand stone wear occurs when the hand stone is valued for its comfort, raw materials are not readily available, or it is more energetically efficient to expand the use-life of the current hand stone instead of searching for raw materials to create a new one (Adams 1993).

Research Design and Methods

A flat sandstone metate will be used in this experiment. Although this type of metate has a large surface area that will make it more energetically efficient while grinding, the challenge will be keeping ground millet from spilling over the edges. This problem arises because a flat metate does not have any sides restricting food being processed from rolling over the edges during grinding. To prevent this from happening the metate will be placed within a bin. This strategy mirrors the actions of prehistoric people who addressed the issue by placing

the metate inside of a basket while they were grinding (Adams 1993). The bin walls will be wide enough so they do not interfere with grinding. However, they will keep the food being processed from getting spoiled on the floor.

Throughout the duration of the experiment, it must be kept in mind that the results are only representative of a flat metate. The type of use-wear present on a basin or troughed metate after grinding for 20 hours will not be addressed. It is likely there would be subtle differences because a flat metate has more grinding efficiency than the other two types of metates. Further experimentation will lead to better conclusions about this.

The different strokes used while grinding pine nuts and other grains during this experiment will be documented. As a result of the grinder's inexperience, it can be predicted that the grinder will naturally use the most simplistic grinding stroke techniques. By evaluating the type of use-wear on the hand stone after 20 hours of grinding, the grinding stroke utilized most often will be determined. A comparison will be made between the grinding strokes used by the inexperienced grinder relative to the different strokes used by Hopi women. This experiment will determine if it is more work to perform use-wear managing strokes or if tilting the hand stone back and forth as it is used happens naturally. Another possibility is that the grinding techniques used depend on the type of food being processed. Small-grained foods tend to be crushed and ground, which results in use-wear similar to that seen on a basin metate. On the other hand, large grained foods are normally sheared and ground which leaves use-wear patterns like those visible on trough or slab metates (Stone 1994). If this is the case, it is expected that the metate used in this experiment will begin to show signs of a basin metate use-wear since small-grained foods such as millet are being processed.

For this experiment, macroscopic techniques and a method of touch will be used to determine the texture of the metate prior to, and immediately following, 20 hours of grinding. Macroscopic analysis of metates includes basic topographical observations. First, these techniques will recognize if use-wear patterns are consistent across the metate surface, or if they are constricted to certain areas. Second, the surfaces of the metate and hand stone will be evaluated to determine if they are level or if there are deviations in height. Third, the texture of the metate and hand stone will be defined as fine-grained, medium-grained, or course-grained (Adams 1989).

In order to control results obtained through touch, six different sandpaper grits will be used. The grit refers to

Furthering Perspectives

Packard

Use Wear Patterns

the number of abrasive particles there are per square inch of sandpaper. The grits vary from coarse, medium, very fine, and extra fine grained. Grit p80 is coarse grained. Grits p100, p120, and p150 are medium grained. Grit p220 is very fine. Grit p400 is extra fine. Before grinding, 50 test subjects will touch the metate and the six sheets of sandpaper. They will compare the coarseness of the particles on the metate to the different grit levels of sandpaper and decide which grit of sandpaper feels most like the metate. Following 20 hours of grinding, this process will be repeated to determine if the coarseness of the metate has changed. Fifty new test subjects were recruited for the second round of tactile surface examination in order to prevent any biases developed by the initial test subjects from being brought into the experiment.

It is hypothesized that 20 hours of grinding will produce visible macroscopic use wear on the metate surface. It is further predicted that individual sandstone grains will be worn down on a microscopic level, smoothing the metate surface, and producing a texture that corresponds with a finer-grained sandpaper. Since the hand stone is spherical, its working surface will continually be worn down to a more level plane. Wear should first be evident on the center surface, and then progress to the edges that are coming into contact with the metate (Adams 1989).

Results

Before use, the metate was macroscopically analyzed. It showed no signs of previous use-wear. The topography of the surface was inconsistent. Small circular depressions and mounds contributed to the rough texture upon touch (Figure 1).



Figure 1. This image shows the metate prior to 20 hours of grinding. The surface texture is composed of depressions and mounds.

The hand stone also showed no signs of previous use-wear despite the large indentations that pocketed its surface (Figure 2).

To determine the coarseness of the metate, 50 test subjects compared its surface texture to six different grits of sand paper (Figure 3).

Out of the 50 test subjects, 44% perceived the sandpaper with grit P120 most closely re-

sembled the texture of the metate surface prior to 20 hours of grinding. Based on these results we can conclude that there were 120 abrasive



Figure 2. This image shows the indentations pocketing the metate surface prior to 20 hours of grinding.

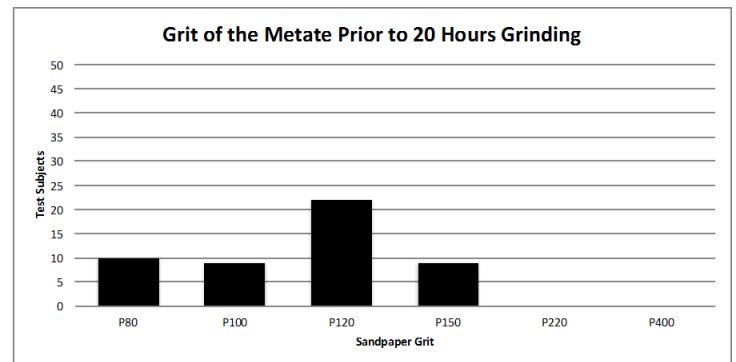


Figure 3. This bar graph shows the responses of 50 test subjects asked to compare the texture of the metate surface to six grits of sand paper prior to the metate being ground on for 20 hours.

particles per square inch on the metate surface before the millet began being processed.

While working on the metate, several different grinding techniques were used (Figure 4).

The first motion felt the most natural. When grinding, the forward stroke exerted pressure on the proximal end of the hand stone. The backwards stroke then exerted pressure on the distal end of the hand stone (Figure 5). This technique helped to keep the millet within the constraints of the metate edges. However, after grinding for extended periods of time this stroke caused discomfort in the wrist of the grinder. Although this grinding technique was not the simplest to execute, it was the most efficient. For this rea-



Figure 4. This image shows millet being processed on the metate.

Furthering Perspectives

Packard



Figure 5. This grinding stroke rotates pressure between the proximal and distal ends of the hand stone.

son, this stroke was utilized most often.

For the second grinding technique the hand stone exerts pressure on the metate surface in a circular motion. This movement results in crushing because the hand stone is being rotated in such a way that the edges come into abrasive contact with the metate while the center pounds down on the millet (Figure 6). One negative result of this stroke is that the millet becomes dispersed rapidly and falls over the edges of the metate. I do not believe this type of grinding technique is practical on a flat metate because too much time is wasted moving the millet from the edges of the metate back to the center in between each stroke. However, this grinding technique felt natural because small foods, like millet, are easiest to process when they are crushed and ground. This action would have produced basin ground stone wear had it been used for an extended period of time.

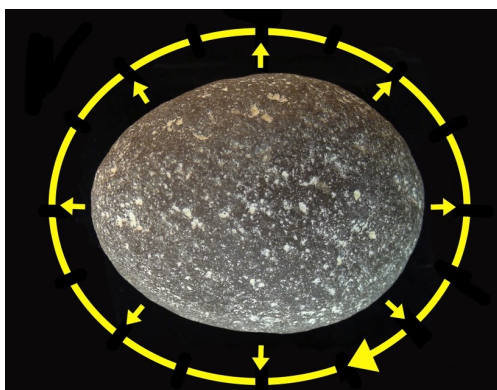


Figure 6. This grinding stroke causes the center of the hand stone to pound down onto the millet while the edges come into abrasive contact with the metate surface.

After a few strokes the millet would have to be pushed back to the center of the metate in order for grinding to be continued. Out of all

Use Wear Patterns

the grinding techniques, this stroke was least efficient in processing the millet.

By looking at the hand stone following 20 hours of grinding, it is clear the first stroke was preferred when processing millet. Figure 8 shows the position that

the hand stone was held in during the 20 hours of grinding. By examining the use wear on the hand stone, the beginnings of a keel can be seen. This triangular use wear occurs when pressure is alternated between the proximal end and distal end of the hand stone during grinding. The line in the figure below represents the keel. The circle encloses the area on the hand stone that shows evidence of use wear following 20 hours of grinding.

The circular indentations that were present on the hand stone prior to 20 hours of grinding are still present, but they are much less pronounced (Figure 9). This is a result of four types of microscopic wear acting on the hand stone: adhesive, fatigue, abrasive, and tribochemical. When two stone surfaces come into contact their molecules interact



Figure 7. This grinding stroke moves the hand stone flat against the metate in a forward and backwards motion.



Figure 8. This image shows the position the hand stone was held in while grinding for 20 hours. The circle shows the area where use wear was apparent and the line represents the beginning of a keel.



Figure 9. This image shows the smooth surface texture of the hand stone following 20 hours of grinding.

and form bonds. Adhesive wear occurs when these bonds break due to the movement of grinding. Frictional heat loosens particles from the hand stone and metate surface. Fatigue wear happens when pressure is exerted on the hand stone and metate during grinding. The highest grains cannot bear the weight caused by this motion and break. This leaves cracks, pits, and eroded material. The particles knocked off by adhesive and fatigue wear remain on the surface of the hand stone and metate. As grinding continues, these rough particles cause abrasive wear. Chemical interactions caused by adhesive, fatigue, and abrasive wear create reaction products. These reaction products build up and are visible as "polish" on the surface of the hand stone and metate. The mechanism causing this is referred to as tribochemical wear (Adams 2002).

The smooth, shiny surface of the hand stone following twenty hours of grinding was a result of these processes.

Sixty four percent of the 50 test subjects thought that the P220 grit of sandpaper most accurately represented the surface texture of the metate following 20 hours of grinding (Figure 10).

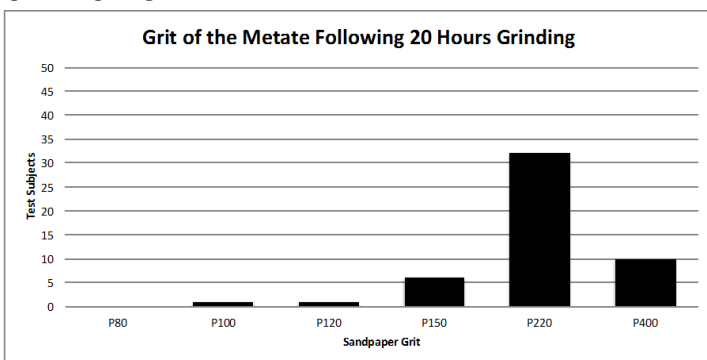


Figure 10. This bar graph shows the responses of 50 test subjects asked to compare the texture of the metate surface to six grits of sand paper after the metate had been ground on for 20 hours.

Based on these results there was a change of 100 abrasive particles per square inch on the metate. As the amount of abrasive particles per square inch on the metate increases, the grit becomes much finer. This is reflected in the smooth texture of the metate.

Macroscopic analysis of the metate following 20 hours of grinding yielded interesting results. First, the use wear that developed in the center of the metate had a visible ovular shape (Figure 11). The coloration on the metate where the use wear occurred is much darker when compared to the rest of the metate surface. This dark, shiny coloration is called "polish" and is a result of micro-

scopic wear processes (Adams 2002). The shape of the use wear reflects the grinding motion used while processing millet. Short back and forth strokes that rotate between the proximal end and distal end of the hand stone worked to continuously smooth the same strip of the metate. All of the hills and valleys that composed the original surface of the metate were worn down on the working surface.



Figure 11. This image shows the smooth surface of the metate following 20 hours of grinding.

Conclusion

Through experimental archaeology with metates, new knowledge is gained showing how prehistoric people used this tool in the past. Use wear analysis of metates from these experiments provides insight into why these tools appear the way they do after performing different tasks (Adams 1989).

Following 20 hours of grinding, some parts of the metate showed more use wear than other parts (Figure 12). While areas in the center of the metate became completely smooth, others maintained a slightly irregular texture. It would be logical to assume that an inexperienced grinder is not as efficient as a prehistoric person at processing millet. This is due to their inexperience performing different grinding strokes. A grinder's techniques directly impact the type and extent of use wear that occurs on a metate. This must be taken into account when comparing experimental results to patterns of use wear seen on actual artifacts in the archaeological record (Shepherd 1992).

The smoother the metate became, the less efficient it was at processing millet. Prehistoric

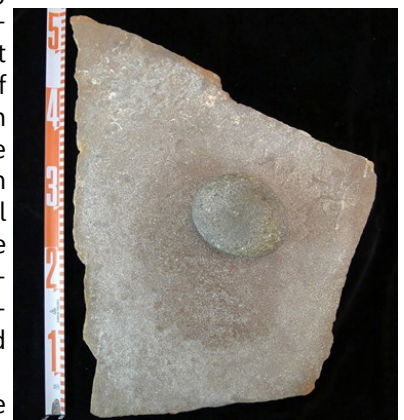


Figure 12. This image shows the hand stone and metate following 20 hours of grinding.

people would have faced this same problem after grinding on their metate for long periods of time. In order to counteract this use wear, pecking was frequently practiced to rejuvenate the grinding surface. The purpose of this action was to roughen the surface of the metate so that grinding could be performed more efficiently (Shepherd 1992 and Schlanger 1991). For this experiment, pecking was purposefully not applied to the metate in order to quantify the amount of use wear that occurred directly from grinding. As a result, changes in use wear on the experimental metate can only be used to accurately represent the amount of time spent grinding on a metate artifact that has not been pecked.

This experiment shows that the surface texture of a metate can be quantified using different grits of sandpaper. There is potential for developing a scale showing the correlation between grinding time on a metate and the amount of abrasive particles per square inch present on the surface. This method of measurement could allow archaeologists to compare experimental results obtained from grinding to ground stone assemblages in order to quantify the degree of utilization on individual artifacts. This information would be useful in interpreting site occupation patterns. Clues from a metate artifact's surface texture could be compared to experimental results in order to estimate the amount of time it was ground on and how intensively it was used. This would provide information as to whether prehistoric people were occupying a site for an extended period of time, coming back repeatedly to the same sites, or carrying a single metate from site to site. The scale could also be used to establish if there is a relationship between the distance a metate is carried and the amount of use wear present on its surface. It would be interesting to see if the total energy invested into transporting a metate was returned in how intensively it was used. Repeated experimentation varying raw material type, grinding stroke, and time would be necessary to expand and solidify this scale so that it could be used to answer additional research questions such as these.

Acknowledgements

I appreciate Pioneer Sand Company's kindness in donating the metate for this experiment. I would like to thank Dr. Richard Adams for suggesting this project and supporting me throughout the duration of the experiment. I want to extend my gratitude to Dr. Jason LaBelle for his constructive criticism in the writing of this paper. I also wish to recognize Spencer Pelton for his guidance and inspiration in conducting this experiment.

References

- Adams, Jenny L.
1989 Experimental Replication of the Use of Ground Stone Tools. *Kiva*, Vol. 54, No. 3, pp. 261-271.
- Adams, Jenny L.
1993 Toward Understanding the Technological Development of Manos and Metates. *Kiva*, Vol. 58, No. 3, pp. 331-344.
- Adams, Jenny L.
2002 Ground Stone Analysis: A Technological Approach. The University of Utah Press: Salt Lake City, Utah.
- Mauldin, Raymond.
1993 The Relationship Between Ground Stone and Agricultural Intensification in Western New Mexico. *Kiva*, Vol. 58, No. 3, pp. 317-330.
- Morris, Donald H.
1990 Changes in Ground Stone Following the Introduction of Maize into the American Southwest. *Journal of Anthropological Research*, Vol. 46, No. 2, pp. 177-194.
- Schlanger, Sarah H.
1991 On Manos, Metates, and the History of Site Occupations. *American Antiquity*, Vol. 56, No. 3, pp. 460-474.
- Shepherd, Ruth A.
1992 A Cultural Model for Groundstone Use in the Middle Rocky Mountains: The Helen Lookingbill Site. *M.A., Department of Anthropology*.
- Stone, Tammy
1994 The Impact of Raw-Material Scarcity on Ground-Stone Manufacture and Use: An Example from the Phoenix Basin Hohokam. *American Antiquity*, Vol. 59, No.4, pp. 680-694.
- Wright, Mona K.
1993 Simulated Use of Experimental Maize Grinding Tools from Southwestern Colorado. *Kiva*, Vol. 58, No. 3, pp. 345-355.

UNDERSTANDING THE VARIATION OF RIO GRANDE CERAMICS

REBECCA SIMON

ABSTRACT

Glaze wares dominated the Rio Grande Valley prior and continuing into the Spanish contact period. Many studies view the development of glaze wares as an indicator for social reorganization and craft specialization. These studies primarily look at compositional data, yet the origin of materials is only one part of the story. The actual function of the vessel is also important to consider. This paper evaluates the porosity and hardness of ceramics from the Rio Grande Valley in order to test the hypothesis that the dominance of glaze wares is a reflection of dietary and social change during the fourteenth and fifteenth centuries. The possible introduction of new foods alongside trade and migrating populations suggests the need for resilient vessels. These initial steps are encouraging in the study of ceramics in larger archaeological discussions of social organization, diet, and exchange.

This paper shares the results of two experiments testing the hypothesis that the dominance of glaze painted wares (from here referred to as glaze wares) in the Rio Grande Valley by the sixteenth century is a reflection of functional necessity. The tests evaluated the porosity and hardness of ceramics from the Rio Grande Valley using a sample from the ceramic teaching collection at Colorado State University. The development and prolonged use of glaze wares in the Rio Grande Valley has long been a point of interest in Puebloan ceramic studies. Glaze paint's complex composition suggests that those using them would have to commit to a certain level of effort (Habicht-Mauche 2006:5-6) thus archaeologists have studied glaze wares for a better part of the past century trying to understand why Puebloans made such a commitment (Habicht-Mauche 2006: 6).

... In time a change occurred. People in parts of the valley who had not used glaze paint before commenced making Glaze-Paint Ware and even traded it to a limited extent. Just how this change came about, we are not certain...

(Shepard 1965:79-80)

Rio Grande Valley Ceramics

Shepard's (1965) work with petrography to determine the composition of ceramics and glazes traced migratory and trade routes of glaze wares throughout the Rio Grande Valley (Scheler 2010:37, Shepard 1965). Her work changed archaeologists' understanding of prehistoric Pueblo peoples by suggesting that not every household made their own pottery, but villages functioned in a system of exchange (Cordell 2006, Scheler 2010:35). Ceramic studies often look at the composition of the glaze itself using electron microprobes and coupled plasma mass spectroscopy to identify lead isotopic signatures (Scheler 2010:37, Habicht-Mauche et al.

2000, 2002; Huntley et al. 2007). These studies add details to the trade and dispersal discussions of glaze wares. Designs on the vessels have been used to infer ideological differences throughout the Rio Grande Valley (Graves and Eckert 1998). Others use attributes such as surface color, vessel size, and size of exterior designs to study changes and developments of ritual feasting (Mills 2007).

Across the entire Southwest region, drastic changes in the ceramic technology occurred from the thirteenth to the fourteenth centuries including shifts in paint composition, color variation in designs, and vessel size (Scheler 2010). The changes resulted in new types, larger vessels, and decorations that included identifiable icons as opposed to predominately geometric designs (Scheler 2010:39). Glaze wares began to appear during this period throughout the region, but their dominance occurred primarily in the Pueblo IV period. The changes in ceramic technology throughout the Puebloan Southwest are most commonly attributed to population shifts, migration, new ritual systems, and ideology (Scheler 2010:39).

In the Rio Grande Valley specifically, Classic period ceramics included plain wares (smeared or obliterated corrugated), black-on-white wares predominately in the northern region, with even some glaze wares in the southern portion of the Northern Rio Grande Valley (Scheler 2010:39). Throughout the region, paints shifted from mineral to carbon based pigment about A.D. 1200 (Cordell 1995) with Santa Fe Black-on-white becoming the most common (Scheler 2010:39). About a hundred years later, the Northern Rio Grande region predominately had local black-on-white wares, most notably Galisteo Black-on-white in the Galisteo Basin (Cordell 1995, Scheler 2010:39).

The inception of glazed wares occurred around 1310-1350 (Cordell 1995:204). Red-slipped glaze wares were first produced near Albuquerque, probably in connection with the Western Pueblos (Scheler 2010). Glaze wares were produced from Sante Fe to Socorro at the same time Jemez Black-on-white wares were produced to the north along the Rio Jemez, Biscuit wares were produced along the Rio Chama to the northeast, and other black-on-white wares were common to the south (Scheler 2010:40). By the mid-1300s glaze wares dominated the traditions in the Galisteo Basin and Pajarito Plateau. Extensive exchange occurred throughout the region and Graves and Eckert (1998: 236-264) suggest that by the fifteenth century this exchange was part of a "highly developed, specialized regional economy." Others describe the exchange and production of glaze wares as the result of ritual and ideological power (Huntley and Herhahn 1996, Spielmann 1998 cited by Huntley et al. 2007). By the time of glaze wares' proliferation, the Pueblo IV period established itself as a very dynamic time. Populations moved out of the Colorado Plateau, San Juan River drainage, and traditional Mogollon territory (Cordell 206:254) at the same time populations grew in the Rio Grande Valley, the ancestral Zuni and Hopi regions, the Salinas area of east-central New Mexico, and in northern Chihuahua, Mexico. Pueblo peoples are known for moving around in order to find more fertile land (Pilcher 2001). Pueblo peoples deserted many of these regions in the fifteenth and sixteenth centuries after Spanish contact, but some still occupy the area today (Cordell 2006:254).

The collection used for this study included three ceramic types commonly found in the Rio Grande Valley from Pueblo III through Pueblo IV: white wares, biscuit wares, and glaze wares. There are many versions of black-on-white ceramics in the Rio Grande Valley, but the sherds used in this study resemble Jemez Black-on-white wares. Graves and Eckert (1998) describe Jemez Black-on-white as having a thick, highly polished, whitish slip with bold and broad carbon-painted designs varying in color from brown to purple. This type dates from the late 1200s to about 1350. Biscuit wares appear in Rio Grande Valley sites, but were produced in the Chama Valley, the Pajarito Plateau, and in the Espanola vicinity. This type further classifies into Biscuit A and Biscuit B. Biscuit A (Abiquiu Black-on-Grey) dates to about 1350-1450 and Biscuit B (Bandelier Black-on-Grey) dates to the following hundred years and differs by the absence of exterior slip and decoration. Thick walls, a fine-textured, light grey-to-white slip, and heavy carbon-painted black designs define biscuit wares as a whole. The final type, Rio Grande Glaze

ware, consists of red- and yellow- slipped vessels decorated with glaze paint, though not completely treated with a glaze finish. Glaze wares have six chronological groups, A through F, primarily based on rim shape and quality of glaze paint. These chronological groups are part of the typological sequence developed by Alfred Kidder in the early twentieth century and further refined with dendrochronology dates by H. P. Mera in 1940 with subtypes defined by slip color, decoration, and temper (Scheler 2010).

The Eighth Southwestern Ceramics Seminar in 1966 divided the Rio Grande Glaze Ware series into three groups: early (Glazes A and B), intermediate (Glazes C and D), and late (Glazes E and F) (Scheler 2010:48) based on glaze color, slip color, and temper type. Early glaze wares have dark paint ranging from black, to brownish black, to greenish black and do not run. Intermediate paint ranges from dull to lustrous with lighter colors while running occasionally. Late glaze paint is the most variable with all of the previous colors present, but it often runs and ranges from semi-lustrous to lustrous (Scheler 2010:48).

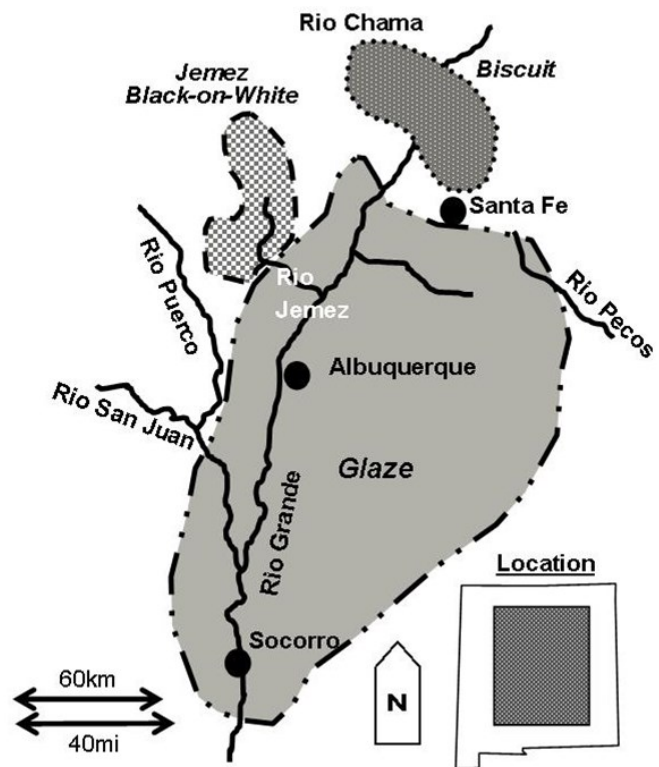


Figure 1: Distribution of major ceramic types in the Rio Grande Valley during the 1500s (adapted from Graves and Eckert 1998).

When discussing a glaze ware assemblage, archaeologists may further refine their typologies based on additional chronological and geographic data. An example of this can be found with Franklin's (2007) work at Pottery Mound in New Mexico. Just looking at the table of indigenous types made at the site Franklin includes specifics such as "Glaze C: Northern Middle Rio Grande" and "Kuaua Glaze/Polychrome" (Franklin 2007:3-4). The sample used in this study has no associated provenience or chronological data so classification beyond the major type was not possible, but identifying the major type and comparing data still allows exploration of large scale trends and questions.

Functional Analysis: Porosity and Hardness

Stark (2006:20) suggests that technological studies provide "methodology" to studying "choice in the archaeological record." While this study does not include the comparative data that Stark (2006) suggests, it does provide a testable hypothesis and methodology in order to bring in new possibilities and better understand the context in which glaze wares became so plentiful in the Rio Grande Valley. As Stark (2006:28) notes, "We cannot explain technological change simply or exclusively through processes of migration." What was it about groups of people moving around that would cause drastic changes in the material record?

Scheler (2010) studied craft production and specialization at the San Marcos Pueblo noting that the data can either be direct (production tools, facilities, and materials used in manufacture) or indirect (compositional studies and the vessels themselves). This study looks at changing diet and social organization. Similarly to Scheler, these tests use indirect evidence for there is little direct evidence of what people actually ate in the record.

In order to test the hypothesis that during the dynamic Pueblo IV period prehistoric peoples relied on more resilient vessels, this study used the variables of porosity and hardness as a proxy for resiliency. Less porous vessels are more effective for wet cooking, food processing, long-term water storage, dry storage, and transport (Chamberlin 2002) which would all be important tasks during a time of cultural exchange and population flux. Harder vessels are also more effective for food processing, long term water storage, dry storage, and transport (Chamberlin 2002) leading one to believe that peoples during the Pueblo III and Pueblo IV periods would more likely use vessels with these properties. Because of the evident dominance of glaze wares in the Rio Grande Valley during those times, it seems to suggest

that these wares were less porous and harder than other contemporary wares. Glaze wares included in this collection would be the least porous and harder, followed by white wares, and biscuit wares.

Kingery (1981) argued for an "inferential objective" and suggested that measuring such properties as strength, hardness, porosity, or color only had significance when looking at material composition (Kingery 1981:460). Even so, Kingery stated that such measurements were not being taken with the goal of supporting or contradicting hypotheses of functional utility and why artifacts are made. By understanding where, how, by whom, and why artifacts were made it is possible to better comprehend technological development. Kingery argues that this approach "leads to immediate inferences about the history and prehistory of ceramics, and is an essential component of every approach toward more all-encompassing historical, archaeological, and anthropological interpretations" (Kingery 1981:463).

Following Kingery's call, Chamberlin (2002) compared a collection of Salinas jars to assess the relative distinctiveness of glaze ware jars during the Pueblo IV period (Chamberlin 2002:269). Using glaze wares, white wares, and what he calls "utility wares," Chamberlin looked at a number of properties related to specific tasks identified by the ethnographic, experimental, and archaeological literature. These tasks included cooking with liquid and dry contents, short and long term liquid storage, food processing, and transport (Chamberlin 2002:276). Chamberlin tested porosity by collecting three different weights of ceramic sherds, W1 a dry weight, W2 the wet weight following 24 hours of immersion in distilled water, and W3 the displaced weight calculated from suspending the sherds in a beaker of distilled water. Following the collection of these weights, Chamberlin calculated "Apparent Porosity" (APA) and "Apparent Water Absorption" (AWA). APA values are the volume of the open pores compared to the total volume of the sherd and AWA values are the percentage increase in weight after saturation. Chamberlin found with both tests that white ware porosity values are higher than glaze and utility ware values, whereas the ranges of values for glaze and utility wares overlap (Chamberlin 2002:283).

Chamberlin (2002) also tested the hardness of the three types. Chamberlin found that white ware sherds were harder than utility ware sherds, but glaze ware sherds were the hardest. "The majority of glaze ware sherds are within a range of five to six on the Moh's scale; white ware sherds typically exhibit hardness values between three and five; and the majority of utility ware

sherds exhibit hardness values between three and four" (Chamberlin 2002:284-285).

Puebloan Diet

Chamberlin's (2002) thorough study examining the different traits associated with specific tasks does not address the factors directly changing the ceramic tradition. One inference suggested here is that the variation of diet possibly occurred in the fourteenth century with increased cultural contact and social reorganization. How does one look at changes in diet with hundreds to thousands of years since the change? Studying food in the archaeological record is no easy feat. There is limited direct data (e.g. stomach contents) and archaeologists rarely can identify individual meals (Gumerman 1997). Flotation samples reveal organic material which provides aggregate data to what people were growing or cooking, but Gumerman (1997) argues that archaeologists are actually looking at production and processing as opposed to directly looking at what people are eating; a distinction made similarly to Scheler's (2010) "direct" and "indirect" evidence when studying specialization and craft production. Indirectly, production and processing provides information about diet through the inference (not certainty) that people are producing and processing in order to eat. Gumerman (1997) also points out that archaeologists use "waste" in their research, but rarely seek to understand "disposal."

Acknowledging drawbacks does not inhibit the possibility of meaningful discussions of Puebloan diet. Researchers believe that glaze wares are used for "mundane food preparation, service, and storage activities" as opposed to ritual because archaeologists recover them from middens and room fill of prehistoric houses (Habicht-Mauche 2006:12). Thus, glaze wares seem related (directly or indirectly) to the diet during the Pueblo III and Pueblo IV periods.

As a result of the dynamism of the Pueblo IV period, this study presumes that foreign foods would make way into the Pueblo Southwest. Historical documents and archaeological evidence shows Plains-Pueblo trade exchange by the sixteenth century (Leonard 2006). Most researchers look at this exchange from a dietary/ecological stance, for example: corn for bison meat (Leonard 2006: 234-235 citing others). Pilcher (2001:660) also notes that Mesoamerican diet heavily influenced the Southwestern diet for "a thousand years," starting with the spread of the agricultural complex of corn, beans, and squash from central Mexico. Minnis and Whalen (2010:245) note that the percentage of domesticated

crops in Mexico that made their way into the Puebloan region is not great, but there is evidence of flow from the south with the presence of gourd, cotton, amaranth, jack bean, lima bean, scarlet runner bean, and tomato in addition to the maize/bean/squash complex. Minnis and Whalen's (2010:253) research also suggests that new foods did not enter the Southwest as a "suite," rather, one at a time as people assessed the usefulness of each new food source.

One of the most important species in Mesoamerican culture, the chile, seems to not have made an impact in the North American Southwest until after Spanish contact (Minnis and Whalen 2010). Only two chile seeds, one possibly cultivated and one wild, date to pre-Spanish contact, which seems to contradict the evident "post-contact dietary exchange" (Minnis and Whalen 2010: 253).

While the direct evidence for what Puebloan peoples ate emphasizes the maize/beans/squash complex, the historical nature of the period seems suggests a more varied diet. This study tested that hypothesis using indirect evidence from the ceramic material. In line with the idea that people had a more varied diet during the Pueblo IV period, the hypothesis arose that a different suite of acids would be evident in the diet. Beyond looking at the attribute of hardness as a proxy for food processing, long term water storage, dry storage, and transport (Chamberlin 2002), this study sought to replicate the introduction of new foods into the region and test if glaze wares could withstand the diversity of acids. The acids tested are not seen in the literature as definitely entering the Rio Grande Valley during the Pueblo IV period, but represent a diversity of goods that could potential come in contact with ceramic vessels.

Acids are not foreign to ceramic analyses; the application of certain treatments is common for removing "insoluble encrustations" as a means of conservation. Previous research notes contamination by chlorides and formation of chromophoric species may occur in earthenware ceramics from treatment with hydrochloric acid (Harrison 2008). Additionally, XRD analyses of ceramics treated with hydrochloric and oxalic acids also revealed a loss of iron oxides occurring from iron rich ceramic glazes (Harrison 2008:272). The effects of nitric (HNO₃), hydrochloric (HCl), and acetic acid were examined with a collection excavated at Kaman-Kalehoyuk (Harrison 2008:271). The XRF data illustrated that treatment with 10% acetic acid induced the fewest changes in the ceramics, while 4% HCl and 4% HNO₃ resulted in greater losses of calcium, potassium, phosphorous, sulfur, arsenic (Harrison 2008:78). Harrison's study concludes that acid type and

ceramic type play a large role in the degree and form of alterations that occur with acid applications; thus the inference that differing diets with a variety of acidic make-up would show a suite of effects on Rio Grande Valley ceramics.

Methods

The sample for this study comes from the teaching collection of Southwest ceramics with no associated provenience at Colorado State University. Teachers and students typically use the collection for typology and classification exercises in introductory classes. Identification of the sherds by temper, paste, and decoration determined them regionally associated with the Rio Grande Valley and include white wares, biscuit wares, and glaze wares. While the lack of specific provenience is traditionally seen as a setback in archaeological research, an opportunity for innovative and new understanding presented itself in regards to studying the ceramic changes in the Rio Grande Valley. Because of the nature of the collection, this project stressed the material make-up of the ceramics as opposed to location or context in order to conduct a potentially controlled experiment. The study included a total of fifty-nine ceramic sherds. The porosity test consisted of fourteen sherds (five white wares, five biscuit wares, and four glaze wares). The hardness test consisted of forty-five sherds (fifteen white wares, fifteen biscuit wares, and fifteen glaze wares).

The first of the two tests measured the porosity of the ceramic pieces. Understanding the function and utility of the wares was the main goal of the project and focused on the surface treatment. The procedure followed Chamberlin's (2002) study with the addition of one step. Prior to submerging the pieces in water, each sherd received two coats of clear nail polish as a sealant along the broken edges. This step facilitated the replication of the original use of the vessel and optimally would cancel out the effects of water absorption through the paste at a broken edge. The three weights described by Chamberlin (2002) were recorded for each of the sherds. The dry weight before and after the application of the sealant was also recorded to determine if the sealant would play a significant role in analyzing the weight of the sherd. The difference was less than 0.2g and in many cases none at all, thus regarded as irrelevant. Following the recording of each weight, apparent porosity and apparent water absorption were calculated according to Chamberlin's (2002) procedure. A simple mathematical comparison of the dry versus wet weights was also calculated.

The second test measured the effects of different acids on ceramic hardness. The treatments included four organic acids identified as being available in common household agents. The control was the fifth acid, hydrochloric acid (29%) assuming that such a strong agent would more likely affect the hardness (See Table 1 for details). The hardness of each sherd was recorded using a Mohs Hardness Scale rating system including a soft crayon (Mohs=1), finger nail (2.5), copper penny (3), knife blade (5), and steel file (7). Three sherds of each type received treatments of each of the five acids on half of their surface. Preference was given to concave sides of sherds as it was presumed that concavity indicated the interior of a vessel and where food would most likely come into contact. The sherds sat with the agents for a total of four days then washed and left to dry over-night. The hardness of each sherd was recorded on both the treated and non-treated portions of each sherd.

Acid	Actual Agent	Chemical Name	Chemical Formula
A	vinegar	acetic acid	CH ₃ COOH
B	hydrochloric acid	hydrochloric acid	HCl
C	lemon juice	citric acid	C ₆ H ₈ O ₇
D	Greek yogurt	lactic acid	C ₃ H ₆ O ₃
E	cranberry sauce	benzoic acid	C ₆ H ₅ COOH

Results

Changes in weight were notable amongst the ceramics in this study. The APA values ranged from approximately 20 to 150 with the glazed wares having the highest values. The AWA values ranged from 2.5 to 4.25 with the glaze wares having the highest values again. While some discussion may occur in regards to these results, because of the great disparity between the glaze ware values and the other types, the simple calculation for difference between wet and dry weights became the focus of the study. The percent of increase in weight for all wares was less than 15%, yet definitely different between each type. The biscuit wares had the largest increase in weight, followed by white wares, then glaze wares.

The hardness test produced some unexpected results. Some wares had an increase in hardness as noted by negative differences. Only the glaze wares experienced a decrease of hardness from each acid treatment with the exception of lactic acid which had no change. Biscuit wares showed a decrease in hardness with hydrochloric acid, lactic, and benzoic. Citric acid had no effect on the

Furthering Perspectives

Simon

Understanding the Variation of Rio Grande Ceramics

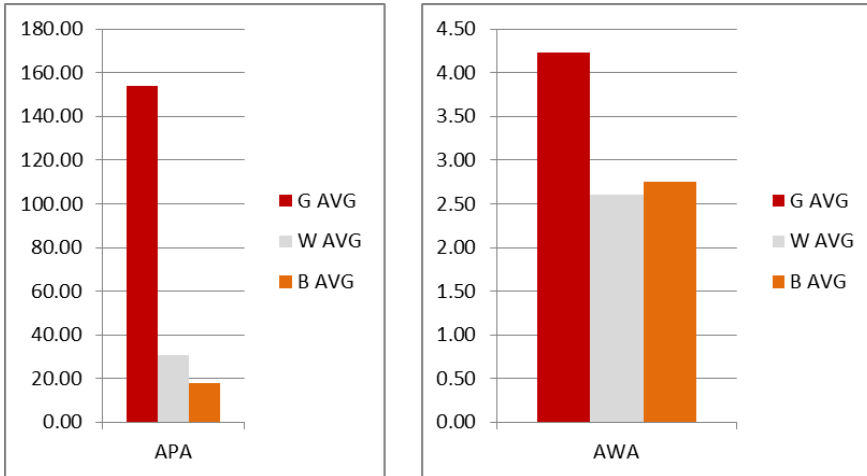


Figure 4: Average APA and AWA values calculated for each ceramic type

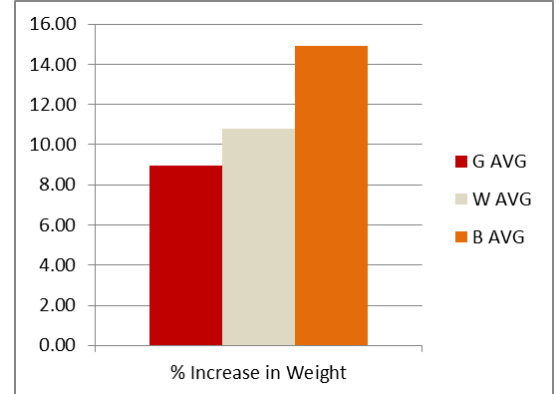


Figure 5: Percent of weight increase as calculated for each type $((W2-W1)/W1)*100$

biscuit wares and acetic acid resulted in an increase in hardness. White wares showed decreases in hardness with acetic and benzoic acid, while substantial increases of hardness occurred with citric and lactic acids, and no change occurred with hydrochloric acid.

Discoloration of the sherds occurred during the hardness test. All of the glaze sherds with benzoic acid, two with hydrochloric acid, and one with citric acid showed some degree in color change. One white ware sherd changed colored slightly in addition to the three white ware sherds with benzoic that had slight purple pigment from the cranberry sauce. Biscuit wares were the least affected in terms of color with two sherds treated with benzoic acid having the slight purple pigment and one with acetic acid showing a slightly lighter shade of the original color.



Figure 7: Discoloration as a result of cranberry sauce treatment (left to right): glaze, white, and biscuit ware.

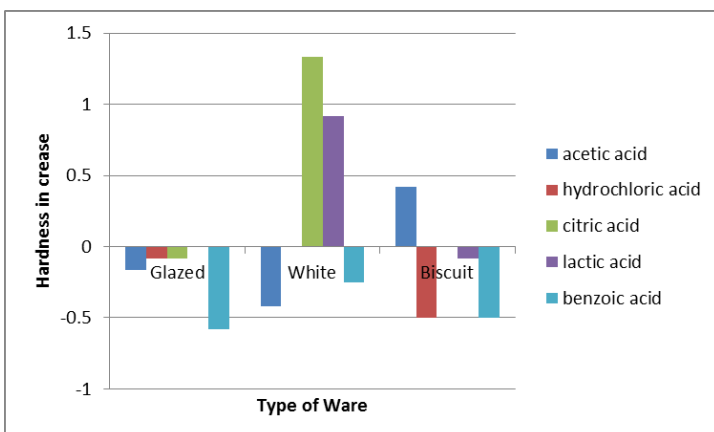


Figure 6: The average increase in hardness between acid treated and non-treated portions of sherds

Discussion

Using Chamberlin's work as a model was useful in regards to establishing a workable time frame and understanding what porosity and hardness can speak to in terms of function and task. The results of the apparent porosity and apparent water absorption for the ceramics in this study resembled Chamberlin's only slightly in the case of average APA for white wares. The glazed ware numbers were nowhere near those found in his study and the AWA values could not be correlated. As a result of this trend, this study focused on the percent of weight increase after being submerged in water for a period. This study worked under the fairly obvious premise that if the ceramic sherd was more porous, then it would absorb more water, and thus increase in weight.

These results reflected a similar pattern to Chamberlin's (2002) with Biscuit wares being the most porous, fol-

lowed by white wares, and then glaze. As noted previously, Chamberlin (2002:278) suggests that low porosity levels are evident in vessels used in wet cooking, food processing, long term water storage, dry storage, and transport; while high porosity levels are found in vessels for dry cooking and short term water storage. To take Chamberlin's logic one step farther, one may assume that the abundance of glaze wares during the mid-1300s until Spanish contact is a result of an increased use of long term water storage and wet cooking as glaze wares were more suitable for such activities in regards to porosity than white or biscuit wares. While not to take away from the purpose of this study, reviewing the results should also include an understanding that Chamberlin's (2002) experiment included a specific collection with whole vessels from a specific context. This study is an example of utilizing abundantly available resources (unprovenanced ceramic sherds) in hopes to provide scientific credibility to the many boxes of material at CSU and further the conversation about this ceramic transition. Obviously additional data can change the story, but the results suggest steps to be taken for broader understanding of the glaze ware phenomenon.

Chamberlin's (2002) discussion of hardness did not include inference as to why hardness might change, but he suggested being harder as associated with food processing, short term water storage, long term water storage, dry storage, and transport. The ability to retain hardness would be important in these tasks as well. The hardness tests of this study were slightly higher than those mentioned in Chamberlin's, yet the focus of this study was the difference in hardness rather than the actual measurement.

Although this test includes data from only a total of 45 sherds over a four day period, a few interesting trends appeared. Glaze wares resulted in decreases of hardness with every agent, except lactic acid where there was no change. Both biscuit and white wares showed increases in hardness in regards to a few of the acidic treatments. Decreases also occurred with the white and biscuit wares and those decreases were greater than those found in the glaze wares. This pattern suggests that glaze wares may represent a compromise in using a type that involved minimal and more predictable effects as a result of different types of foods. The increases in hardness found with white wares and biscuit wares are likely the result of a film or residue accumulating on the sherds. The two agents, yogurt and lemon juice that are more readily associated with the increase, often leave residues on surfaces even after being washed.

Discoloration noted in this study primarily resulted from the fifth agent (cranberry sauce) which is representative of having significant amounts of benzoic acid. While it is important to note this observation, the nature of the acid seems to be less at work than the composition of the sauce itself. Additionally, the discoloration and hardness were not correlated.

The sample size prevented significant statistical analysis, such as a chi square or linear regression, but the raw data combined with an understanding of the Pueblo III and Pueblo IV periods provides a new view on why glaze wares became so prevalent. Eckert (2006b) examined the ceramic assemblages of three central Rio Grande sites, Pueblo del Encierro, Tijeras Pueblo, Hummingbird Pueblo, and the northern site of Arroyo Hondo to understand why some places eventually only used glaze wares while other had a combination of wares. She found that glaze technology's adoption throughout the Rio Grande Valley differed from village to village "and cannot be explained simply through the presence of immigrants, the adoption of a new ritual system, or the creation and maintenance of exchange networks" (Eckert 2006b:175). This study does not aim to simplify the discussion of glaze technology but add another piece to the puzzle: variation in diet.

The use of acids in this study originated because of the heavy influence of Mesoamerican and Spanish cultures on the Southwest (Pilcher 2001). When one thinks "Mexican food," often tomatoes and chiles come to mind. Unfortunately, Minnis and Whalen (2010) point out that the direct evidence for the presence of these crops prior to Spanish contact is minimal at best, thus the correlation between the acid and the glaze wares is weak. Even so, this study presented a new way to indirectly test to understand Puebloan diet. Currently, the majority of the direct evidence for Puebloan diet does not include things that would be particularly acidic in nature (Minnis and Whalen 2010). Yet other evidence does tell us that Puebloan peoples traded and came into contact with other cultures, such as Plains nomadic groups (Leonard 2006). Also, as noted previously, new foods did not enter the Southwest as a "suite," rather, one at a time as people assessed the each food's usefulness (Minnis and Whalen 2010:253) indicating that diet was often changing. Variety in diet seems to be a reasonable assumption, even if the foods did not differ in acidic level. In this light, the very nature that the agents used in this study represent a variety of foods (even if not the exact foods Puebloans ate) suggests that certain vessels were more predictable in how they reacted to contact with food. If one knows there are a lot of different people coming and going, bringing

their religion, their goods, and their food, one might prefer a vessel that could stand up to all of that, even if he or she did not know what was coming next.

Conclusion

In her summation of several papers studying Southwestern glaze wares, Cordell (2006:271) cites Schiffer (1987) when she calls for "more analyses at scales appropriate to the aggregate nature of much archaeological data that are the products of cultural and natural formation processes." While hardly at the "appropriate" scale, this study hopes to spark further analyses of this nature. This paper started with a goal of understanding why glaze wares would come to replace both white and biscuit wares during the protohistoric period through Spanish contact. Prior studies looked at the development of glaze wares, in particular the isotopic signatures of the glazes themselves, as indicators for social reorganization and craft specialization. Moving beyond the origin of the materials, this study focused on the function of the ceramic vessels by testing the porosity and hardness levels to better understand the actions of the Puebloans in the fourteenth and fifteenth centuries. The results of these tests indicate that the dominant glaze wares would be more appropriate for tasks associated with increased social complexity and exchange, such as long term water storage. Additionally, glaze wares withstood changes in hardness levels more regularly than the white or biscuit wares suggesting that with increasing cultural contact and introduction of exotic foods, glaze wares would last longest, or at least more predictably. While the results of this study could not confidently identify a particular addition to the diet of the Rio Grande Valley, the comparisons between the three types found in this region seem to suggest that in a time of great change and reorganization, glaze wares were the most reliable and thus the constant in the lives of Ancient Puebloan peoples.

Acknowledgements

First I would like to thank Dr. Mobley-Tanaka for her encouragement even when I thought the data did not mean a thing. I would also like to acknowledge Dr. Jason LaBelle for allowing me to use pieces from the CSU teaching collect for my project. Special thanks go to my classmates Kristi Gensmer, Chris Johnston, Ben Perlmutter, and Raphael Ruiz for suffering through my initial findings. Thanks also go to Cody Anderson and Dr. Kari Schlerer for guidance towards research that better grounded my arguments. Finally, I want to acknowledge Dr. Claire Milner for instilling in me a love of archaeology and ceramic analysis.

References

Chamberlin, Matthew A.
2002 Technology, Performance, and Intended Use: Glaze Ware Jars in the Pueblo IV Rio Grande. *Kiva* 67(3):269-296.

Cordell, Linda S.
1995 Tracing Migration Pathways from the Receiving End. *Journal of Anthropological Archaeology* 14:203-211.
2006 Rio Grande Glaze Paint Ware in Southwestern Archaeology. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp.253-271. Tuscon, AZ.

Eckert, Suzanne L.
2006a The Production and Distribution of Glaze-Painted Pottery in the Pueblo Southwest: A Synthesis. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp. 34-59. Tuscon, AZ.
2006b Black-on-White to Glaze-on-Red: The Adoption of Glaze Technology in the Central Rio Grande Valley. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp. 163-178. Tuscon, AZ.

Franklin, Hayward H.
2007 Rio Grande Glazeware Classification at Pottery Mound, New Mexico. *Pottery Southwest* 25(4):2-4.

Graves, William M. and Suzanne L. Eckert.
1998 Decorated Ceramic Distributions and Ideological Developments in the Northern and Central Rio Grande Valley, New Mexico. In *Migration and Reorganization: the Pueblo IV Period in the American Southwest*, K A Spielmann, ed. Arizona State University Anthropological Papers No. 51, pp 253-262.

Gumerman IV, George.
1997 Food and Complex Societies. *Journal of Archaeological Method and Theory* 1(2):105-139.

Habicht-Mauche, Judith A.
2006 The Social History of the Southwestern Glaze Wares. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp. 3-16. Tuscon, AZ.

Habicht-Mauche, Judith, Stephen Glenn, Homer Milford, and A. Russell Flegal.
2000 Isotopic Tracing of Prehistoric Rio Grande Glaze Paint Production and Trade. *Journal of Archaeological Science* 27:709-713.

Habicht-Mauche, Judith, Stephen T. Glenn, Mike P. Schmidt, Rob Franks, Homer Milford, A. Russell Flegal.
2002 Stable Lead Isotope Analysis of Rio Grande Glaze Paints and Ores Using ICP-MS: A Comparison of Acid Dissolution and Laser Ablation Techniques. *Journal of Archaeological Science* 29:1043-1053.

Harrison, Ainslie
2008 Effects of Acid Treatment on Ceramics from Kaman-Kalehöyük. *Anatolian Archaeological Studies* 17:271-280.

Huntley, Deborah L., Katharine A. Spielmann, Judith A. Habicht-Mauche, Cynthia L. Herhahn, A. Russell Flegal.
2007 Local Recipes or Distant Commodities? Lead Isotope and Chemical Compositional Analysis of Glaze Paints from the Salinas Pueblos, New Mexico. *Journal of Archaeological Science* 34:1135-1147.
Kingerly, W.D.
1981 Plausible Inferences from Ceramic Artifacts. *Journal of Field Archaeology* 8:457-467.

Leonard, Kathryn.

2006 Directionality and Exclusivity of Plains-Pueblo Exchange during the Protohistoric Period, AD 1450-1700. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp. 232-252. Tuscon, AZ.

Mills, Barbara J.

2007 Performing the Feast: Visual Display and Suprahousehold Commensalism in the Puebloan South. *American Antiquity* 72(2):210-239.

Minnis, Paul E. and Michael E. Whalen.

2010 The First Prehispanic Chile "(Capsicum)" from the U.S. Southwest/Northwest Mexico and its Changing Use. *American Antiquity* 75 (2):245-257.

Pilcher, Jeffrey M.

2001 Tex Mex, Cal Mex, New Mex, or Whose Mex? Notes on the Historical Geography Southwestern Cuisine. *Journal of the Southwest* 13(1):659-679.

Schachner, Gregson, Deborah L. Huntley, and Andrew Duff.

2011 Changes in Regional Organization and Mobility in the Zuni Region of the American Southwest during the Pueblo III and IV Periods: Insights from INAA Studies. *Journal of Archaeological Science* 38:2261-2273.

Schiffer, M. B.

1987 Formation Processes of the Archaeological Record. Albuquerque: University of New Mexico Press.

Schiffer, Michael B., James M. Skibo, Tamara C. Boelke, Mark A. Newupert, and Meredith Aronson.

1994 New Perspectives on Experimental Archaeology: Surface Treatments and Thermal Response of the Clay Cooking Pot. *American Antiquity* 59(2):197-217.

Schleher, Kari Lynn.

2010 The Role of Standardization in Specialization of Ceramic Production at San Marcos Pueblo, New Mexico. PhD. dissertation, Department of Anthropology, University of New Mexico, Albuquerque, New Mexico.

Shepard, Anna O.

1965 Rio Grande Blaze-Paint Pottery: A Test of Petrographic Analysis. In *Ceramics and Man*, F. Matson, ed. Aldine Publishing, pp 62-87. Company, Chicago.

Spielmann, K.A.

1998 Ritual Influences on the Development of Rio Grande Glaze A Ceramics. . In *Migration and Reorganization: the Pueblo IV Period in the American Southwest*, K A Spielmann, ed. Arizona State University Anthropological Papers No. 51. pp. 253-261.

Stark, Miriam T.

2006 Glaze Ware Technology, the Social Lives of Pots, and Communities of Practice in the Late Prehistoric Southwest. In *The Social Life of Pots: Glaze Wares and Cultural Dynamics in the Southwest, AD 1250-1680*. The University of Arizona Press, pp. 17-33. Tuscon, AZ.

Spielmann, K.A.

1998 Ritual Influences on the Development of Rio Grande Glaze A Ceramics. . In *Migration and Reorganization: the Pueblo IV Period in the American Southwest*, K A Spielmann, ed. Arizona State University Anthropological Papers No. 51. pp. 253-261.

POST-MORTEM CARE WARFARE: CAN CONFLICT BETWEEN MANDATED AUTOPSIES AND CULTURAL EXPECTATIONS FOR POST-MORTEM BODY CARE BE RESOLVED?

JOSHUA CLEMENTZ AND BONNIE GLASS-COFFIN

ABSTRACT

Different perspectives on post-mortem body-care have resulted in conflicts between medical examiners and the deceased's relatives over the conduction of mandatory autopsies. These conflicts have received little attention from the academic community and as a result there has been no discussion in methods to resolve and prevent these conflicts. Through the analysis of forensic procedure, different cultural beliefs, and similar conflicts within the medical field, methods for mitigation can be defined. Medical examiners should gain knowledge about different cultural perspectives, show culturally relevant respect towards the deceased and their families, and open dialogue to allow differences to be bridged.

Introduction

In 2005 a young man died in a vehicular collision. As mandated by the state of New York, an autopsy was performed upon the body by a trained medical examiner. After a period of three days, the body was released to the family for internment. The office, however, chose to retain the brain for further testing and did not notify the family of this decision. Several months later this action was discovered via a classmate of the deceased's sister during a fieldtrip to the medical examiner's office where the labeled brain was on display in a jar. The deceased's family was horrified and outraged at this disrespect to their son; not only because the coroner had not informed them but also because they had held a funeral that was not complete according to their Roman Catholic beliefs. The family immediately filed a suit and was able to gain possession of the brain in order to hold a second funeral. The litigation that followed between the family and the medical examiner, however extended for over half a decade (Leddy 2010).

This example illustrates the conflicts that can arise between a coroner and the surviving family and friends of the deceased in the United States because of differing perspectives of after-death body care. On the one hand, the medical examiner is mandated by law to perform autopsies upon the deceased, which in some cases requires the retention of organs or tissue cultures for further examination. On the other hand, the deceased's relatives may have other cultural values and beliefs that require specific treatment of the body in order for the funerary rites to be a success. As the above example expresses, these conflicts often result in a prolonged and slow process that disrupts the coroners work and

presents them as villains. These conflicts also create anxiety among the deceased's relatives over the individual's fate and over the treatment they may receive upon their own death. The battle ultimately leaves both parties dissatisfied and prevents closure for all parties involved.

Although these conflicts can be extremely emotional and traumatic for both parties, the conflicts that arise due to differences between forensic procedures in mandated autopsies and the public's cultural expectations for post-mortem body care has surprisingly received little attention from the academic community. Very few case-studies have been written documenting this type of conflict and none have suggested ways in which medical examiners might mitigate or reduce these sorts of conflicts. This lack of information will be addressed throughout the course of this paper; these conflicts can and should be mitigated and resolved in a viable manner.

It then follows that the primary goal of this paper is to first define and analyze the complex nature of the conflict between forensic autopsy procedures and the many varied cultural beliefs and practices surrounding death in the United States. Then to provide a way forward via the application of conflict resolution techniques developed in clinical settings to address similar problems. The analysis will use the approach taken by critical medical anthropologists. Particular attention will be paid to the work of Arthur Kleinman and his eight questions.

In order to address these goals the paper will be organized in the following fashion. First, it will more explicitly outline the critical medical anthropology para-

digm. Second, it will provide a concise definition of forensic autopsy and other differing views on after-death body-care. Then it will compare the conflicts in the forensic setting to those in the clinical setting and apply the conflict resolution methods of the later to the former. The intention being to offer a way towards productive conflict resolution.

Theoretical Framework

The paradigm that will structure my analysis of the conflicts over after-death body-care is critical medical anthropology. This approach is part of a larger movement in anthropology that began in the 1970s to incorporate more critical analysis of both the political and economic structures that influence and define cultural norms. Specifically in medical anthropology the critical approach appeared in its early forms in the work of Soheir Mory, who was one of the first to provide a clear discussion of the political-economy of health (Baer et al. 2003).

The goals of critical medical anthropology are many and as such there are many nuances to the expressed form of the approach. However, there are some unifying themes across medical anthropology. First and foremost, there is an emphasis to illuminate underlying political and economic factors that influence healthcare by bringing to light what is invisible or hidden. The focus of this analysis tends to be on the historical development and enactment of asymmetric power relationships in an effort to understand what empowers specific groups and cultural constructions over others. Interestingly, critical medical anthropology takes the critique that these power relationships further applies them to anthropological work by emphasizing the political nature of research. The significance of this attempt to illuminate the invisible within anthropology is quite profound. As by addressing the inherent power dynamics within anthropology, it potentially facilitates the creation of more sound research that can better address the power relationships within the healthcare system (Baer et al. 2003).

Another important perspective in critical medical anthropology, and the one that is more heavily emphasized by Arthur Kleinman, is that disease not only has a biological origin but also has a social origin. First, the conceptualization of disease is socially-constructed in that ailments are attributed by culture to specific diseases and treatments. Second, disease is influenced by the total social-cultural environment under which people live, in that larger political and economic factors play a significant role in the presence and form of disease (Baer et al. 2003; Kleinman 2006).

Specific to the problem at hand, like disease death is understood to be socially-constructed. In that death is not solely biological but encompasses many social-cultural factors that influence its experience by the deceased and their shared community. Furthermore, the main goal of this paper, like critical medical anthropology, is to illuminate what is hidden. By bringing to light these conflicts it opens the doors for constructive action to be taken towards the resolution of these conflicts over after-death body-care.

Autopsy

An autopsy, in the most basic sense, is a post-mortem examination of a deceased individual. It usually entails the thorough investigation of the external and internal body in order to identify any injuries or diseases, and to determine the cause and manner of death. Autopsy is rooted heavily in the cultural heritage of the United States, originating with the ancient Greek scientist, Herophilus (Burton 2010). Initially autopsy was designed to investigate the human body in order to understand the structure and function of the human being as a physical entity. The process was perfected during the Age of Enlightenment when modern sciences were coming to fruition. With time, autopsy shifted away from being a basic exploration of the body to being a highly regulated systematic tool for understanding human anatomy and physiology, one that can be applied to both medical and legal contexts.

The key cultural belief in the United States that has informed the acceptance of autopsy that was also solidified in the Enlightenment period is the distinctly Western tradition of separating the secular and the spiritual. In this understanding there is a division between the physical human body and the spiritual existence of a being (Imhof 1996). As there is held to be a separation of the soul from the physical form upon death, the body is viewed as being an empty vessel. This fundamental cultural tradition is what allows autopsy to have such prevalence in the Western world compared to other cultural groups (Grimes 1986).

The modern autopsy is a regulated scientific procedure that in practice is very uniform across the United States. There are two forms of autopsy, clinical and medico-legal autopsies (Illinois Coroners and Medical Examiners Association (ICMEA) 2005; Midwest Medical Examiner's Office (MMEO) 2011; Nath, 2011; State of New York 2011). Clinical autopsies are those that occur within a clinical setting following the death of an individual. These are usually performed by a resident physician. These au-

toppies are always voluntary. They are usually conducted to determine the medical reasons for an individual's death and the identification of hereditary diseases that surviving relatives may wish to know about (Nath 2011). For the sake of organization clinical autopsies will also include those cases in which individuals have donated their bodies to science for research or education purposes. The common denominator here is that all three reasons for autopsy are under voluntary control. The deceased has either given permission for this procedure in a Living Will or next-of-kin have been granted control over the disposition of the body. Therefore, the decision is by choice rather than mandatory.

Medico-legal autopsies are quite the opposite of clinical autopsies in that they are mandatory under most circumstances. These autopsies are conducted on the deceased as part of a criminal investigation or under the premise of a public health threat. They can be conducted by a selected physician, a trained pathologist, or even the county sheriff depending upon local laws (ICMEA 2005; Nath 2011; National Association of Medical Examiners and The College of American Pathologists (NAME) 2003). This form of autopsy will be the focus of this paper as most conflicts derive from its mandatory nature.

In the United States the circumstances under which medico-legal autopsies are conducted is strictly regulated by law. In earlier years the guidelines for autopsies in criminal investigations were controlled by common law; however, in recent decades control has shifted to state statutes (Nath 2011; NAME 2011). Due to the medico-legal autopsy being regulated by individual state entities there is a high degree of variability in the laws pertaining to the procedure.

In most states it is mandatory for a medical examiner to conduct an autopsy on the deceased in cases of: homicide, suicide, accidental death, death under suspicious or unusual circumstances, a terrorism event, and suspected public health threats (ICMEA 2005; Office of Chief Medical Examiner (OCME) 2011). This list is far from exhaustive and as expressed by the example above the state of New York also includes vehicular accidents as warranting mandatory autopsy (Leddy 2010; New York 2011). It is important to understand that these autopsies are deemed mandatory due to the perception that the autopsy is being undertaken for the public good, and because the principle of individual justice that is served by this mandate is a strong value in general American culture.

Interestingly there are some states, including New York, that have provisions for the objection to autopsy based on conflicts with the deceased's religious beliefs

(Nath 2011; New York 2011). When objections are filed, the coroner has to re-evaluate if the situation does indeed warrant that an autopsy be conducted. If after review it is still deemed necessary, the relatives of the deceased may file a complaint with the state in order to prevent the body's dissection. For those states that do have these provisions the process is usually kept secret. When autopsies are questioned, it usually involves a lengthy court procedure which may cause burial delays (Nath 2011). The other issue is that although we like to believe access to courts is a civic right, those of poor economic status may not have the finances to fund a complaint and are thus unable to prevent the dissection of their relative's body.

Although the law regulates the circumstances that require mandatory autopsies, there are no requirements for how autopsies are actually conducted. However, medical examiners in various states have come together to create guidelines for how autopsies are supposed to be conducted. For the sake of brevity the focus here will be upon the requirements an individual must fulfill to become a medical examiner and the dissection process itself. Depending upon the state, different individuals can function as the medical examiner. The two most common types of individuals that perform these duties are physicians and degree educated pathologists. A less common but still prevalent individual who functions as an examiner is the acting sheriff (NAME 2003). Now as one might imagine the procedures for conducting autopsies of a medically trained professional and the sheriff who may not have a degree with a medical background will likely be very different. Interestingly though both parties experience similar number of conflicts over body-care with the deceased's relatives.

The guidelines for human dissection are often varied but typically include the following. In general it is held that a "y" style incision is made in order to allow for ease of access to internal organs and the ability for an open-casket viewing at a funeral (ICMEA 2005; OCME 2011). Special care is traditionally taken to preserve the locations of organs within the body; however, during the course of autopsy, they are removed and analyzed by viewing, weighing, and by possible dissection if it will aid in determining the cause of death (ICMEA 2005). Extra tests are mandated depending on the need to determine the cause of death (OCME 2011). If a crime has occurred it is important to understand that the medical examiner will take into account other details of the crime to determine how and where the dissection will occur. For example, if an individual was shot in the stomach then the dissection

of the head would in most instances not occur. The process is always attempted in the most professional and respectful manner possible given the circumstances of the nature of the investigation (ICMEA 2005; OCME 2011).

After the autopsy is conducted, the remains are traditionally returned to the next of kin or those in charge of the funerary procedure. In some instances organs and tissues may be retained for further testing while the body is released to allow for speedy burial. The laws over the retention vary by state; some require the consent of the family while others do not. In cases where consent is not required organs and tissues may be retained indefinitely and information about their retention may or may not be shared with the family. If the retained materials are not returned to the family after testing they are usually cremated as organic wastes (Nath 2011).

Death Beliefs and Practices

The United States is a country built by a vast collection of immigrant people from the world over, and as such there is a great diversity of beliefs and practices surrounding death. The seven examples that follow simply touch upon that diversity both between religions and within religions. It is important to keep in mind that the discussion below will remain generalized in order to supply points of departure from which different beliefs and practices about death can conflict with the forensic procedures discussed above.

Islam

In the Islamic faith death is viewed as the next phase of life. The dead are prepared for internment by a ritual cleansing, positioning the body towards Mecca, and covering the body with a white cloth. Until the date of the funeral, the deceased must never be left alone and must not travel far from his/her location of death (Gilanshah 1993; Rispler 1993). Mourners are expected to be quiet and reserved when in the presence of the dead (Lapidus 1996). All this is done in order to preserve the dignity of the body, to show respect to the deceased, and to allow for the spirit to travel smoothly along the path of Allah into the next phase of life (Gilanshah 1993; Lapidus 1996).

The largest concerns Muslim people have towards forensic autopsy is the desecration of the dead that is caused by the destruction of the physical form as well as the confusion of the deceased's soul due to lack of proper respect and ritual. The human body is viewed as a sacred vessel created by Allah and if it has lost its form then it has lost its dignity. The end result is that the body has fallen to sin (Burton 2010; Carpenter 2011; Rispler 1993).

Furthermore, some believe that the soul inhabits the body until the proper funerary rites are conducted (Burton 2010; Gilanshah 1993). Accordingly the deceased would then experience the horrific event of being dissected should autopsy be performed. This in turn creates an extremely distressing experience for the deceased's relatives. Also the transportation and time delay caused by the forensic procedures may result in the soul's confusion by disrupting his/her path to Allah. If severe enough, the disruption could result in the soul returning to revenge itself upon the family (Burton 2010; Gilanshah 1993; Rispler 1993).

Judaism

The Jewish faith is governed by Jewish law, which is defined in modern times by the nation of Israel. Jewish funerary practices follow a strict set of rules designed to show respect for the dead and provide equal internment to all no matter the individuals' social or economic status. At the time of death, the body is laid upon the floor with a simple white cloth draped over him/her. Someone remains with the deceased until internment as the body is to never be left alone. The burial usually takes place within the same day as the death (Cytron 1993; Ponet 1996).

The Jewish concern with autopsy is very similar to that of Islam in that autopsy desecrates the dead by physical alteration and disrespects the dead by disruption of funerary practices. The body is viewed as being made in the image of God and is therefore a holy vessel which the soul will return to at the time of resurrection (Carpenter 2011; Cytron 1993). When a body is dissected, it is seen as a wicked act against God and the deceased (Carpenter 2011). Furthermore, the body being left alone in an operating room and the burial delays are a sign of extreme disrespect toward the deceased. Interestingly though, under Jewish law an exception can be made in favor of autopsy if it brings further respect and honor to the deceased by helping bring a criminal to justice or by providing information about an illness that may save the lives of others (Burton 2010). However, although this exception exists, it should not be assumed to be the norm of Jewish belief (Dorff 2005).

Christianity

The Christian faith is diverse within the United States with innumerable different sects making up the predominate religion. As such, the practices and beliefs about death vary widely depending upon which Christian group is being discussed. The mode of internment can be being laid directly in the ground, placed within coffins of vary-

ing degrees of complexity or even being cremated and placed in an urn or with ashes scattered to the wind. Some funerals hold open casket ceremonies while others are closed. Most funerals focus upon the death and the grieving process, while others such as the Unitarian Universalists focus upon the life of the individual and hold the ceremony well after the actual burial takes place (Irish 1996). In general most Christians believe in a resurrection event, wherein the son of God following the rising sun will restore the dead to life. As such, Christians traditionally orient the dead eastward towards the new dawn. Christians also believe that because the human body was created in the image of God it deserves a great amount of post-mortem respect.

Among all these Christian sects there is usually very little conflict with the practice of autopsy so long as the body is treated with the utmost respect by the medical examiner. However, there are examples to the contrary. For example, the Church of Latter Day Saints support the idea that it is for the individual to make a decision about whether an autopsy is acceptable and by making the choice it would bring them peace of mind (Burton 2010). Should they choose against autopsy then a mandatory autopsy may bring the deceased's relatives into conflict with the medical examiner because of the possible distress of autopsy for the deceased's soul. As with the introductory example described above, the Roman Catholic family felt their son had been improperly buried because the brain was not present at the time of burial (Leddy 2010). This is a reflection of how the medical examiner violated expectations of respect both for the deceased and for the family, not only by removing the brain, but also by not informing the family of its removal. Although conflicts are rarer among this group, they still occur.

Hinduism

The Hindu faith revolves around the cycle of life, a belief in life with a belief in death and rebirth. The ultimate objective of Hinduism is the escape from the cycle into a higher state of being (Vatuk 1996). Unlike Western culture, death is not separate from life but is viewed as another stage in the life cycle. As such, when the elderly near the end of their lives they make provisions to prepare their family and themselves for death. Those elderly members begin to remove themselves from the living by spending more time conducting religious rituals and by engaging in internal contemplation about their next phase in life. This is viewed as an appropriate method to start the smooth transition into death. After death, the family takes over and continues prying and having a

priest directed funeral prior to cremation to ensure a smooth transition; ultimately the ashes are scattered into a holy body of water (Vatuk 1996).

The conflicts that occur with autopsy revolve around performing an autopsy too early due to a belief that this disrupts the deceased's smooth transition into death. The soul is believed to be aware until it has passed on to the next phase of life. An autopsy performed too early may cause distress to the soul and cause it to reenter the body thus preventing it from continuing the cycle or even causing it to become an evil entity (Burton 2010). This, as can be imagined, causes a great amount of distress to the deceased's relatives, especially as a smooth transition to death is integral to the soul's continued existence.

Buddhism

The Buddhist faith focuses on the achievement of the clarity of mind. In Buddhism the goal is enlightenment and the escape from the cycle of birth and rebirth. Buddhists believe that the body is only a shell that a human inhabits during life and as such an individual should not be too attached to it. Their focus should be on the mind (Truitner 1993). There is, however, a belief in some traditions that the soul does not leave the body for three days and therefore the body must remain undisturbed until the three days have passed or until a priest has determined the soul to have left the body. During these three days, the dead focuses upon attaining enlightenment (Burton 2010). After the soul is declared to have left the body, the body is then traditionally cremated (Truitner 1993).

In general Buddhists do not have conflicts with autopsy as they believe it is a valuable and compassionate tool for the preservation of life (Burton 2010). Like Hinduism the only major conflict that arises is the performance of an autopsy too early. Autopsies conducted within the three days are discouraged because of the time necessary for the soul to vacate the body. In this case the soul may experience the autopsy and the event could disrupt the dead's concentration upon achieving enlightenment, thus forcing him/her into another round of the life cycle (Burton 2010; Carpenter 2011). This is viewed as one of the most disrespectful acts toward the dead (Burton 2010).

Hmong

The Hmong culture has an extremely involved ritual process for the burial of the dead. It may take as few as thirteen days and as long as three weeks to conduct the entire procedure. Hmong believe an individual has three

souls and that each must be guided into the afterlife. To appease the souls and help them transition into the spirit realm the Hmong chant ritual texts, play religious instruments, and sacrifice animals. These practices usually involve the entire extended family as well as involve a shaman who conducts the rituals (Bliatout 1993; Falk 2004).

Within the United States there are many conflicts between general post-mortem practices and these cultural practices. Funeral homes lack the space for the large ceremony. Additionally there is a lack of acceptance regarding the length and customs of these funerary rites. These conflicts already cause much distress for Hmong families attempting to perform the proper funerary rituals (Bliatout 1993). When mandatory autopsies, which disrupt the necessary rituals to help the soul move on, are added to the mix, it creates an atmosphere where the soul may become trapped and vengeful towards the family. This is caused by the souls' experience of the autopsy due to still being associated with it as the proper rituals have not been conducted (Burton 2010; Bliatout 1993). Furthermore, the Hmong also fear that autopsies will introduce foreign metals into the body which may cause damage resulting in disfigurement in the next life (Falk 2004).

Native American

Even more so than Christianity, traditional Native American faith systems are extremely diverse. The traditions and beliefs are dependent upon which local group is being discussed. In a general sense many groups have rituals that are intertwined with the supernatural and are designed to allow the individual to pass into the spirit world. The body is usually purified in some manner such as with the use of sage smoke. Funeral rites tend to be extremely emotional and personal. Examples may include the viewing of the deceased prior to burial and the grave digging and burial done directly by the family (Brokenleg 1993; Burton 2010).

Native American faiths view autopsy in similar ways as the others in that autopsy is a desecratory act that is a sign of severe disrespect to the deceased and his/her relatives. It is also seen to disrupt the procession of rituals necessary to allow the individual to pass into the spirit world to join the ancestors. This disruption causes the same distresses discussed with the groups above in that the deceased may experience the autopsy and also be prevented from finding their way to the spirit world, being stuck in their body as a result of this distressing experience (Burton 2010).

Many Native Americans may also view the practice of autopsy as a continuation of European exploitation because they can play into the contention revolving around the scientific study of Native American remains by anthropologists. Even with laws such as NAGPRA, that directly address the post-mortem disposition of remains found in archeological contexts, there is still a great amount of distrust between the Native Americans and Western science, including the practice of autopsy (Grimes 1986).

Clinical Comparison

As there are complex systems of beliefs for after-death body care there are equally complex systems of beliefs for end-of-life body care. For this reason similar conflicts occur within the clinical setting over the differing perspectives of the patient, their relatives, and the medical staff over proper treatment for terminal conditions. Unlike the forensic field though, there has been a greater attempt to establish a working means to mitigate these problems. Because of this, clinical practice will provide an excellent framework for the directions that need to be taken by medical examiners to mitigate conflicts involving autopsy.

One of the earliest steps taken was the development of the four principles as part of the "Belmont Report" created by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. These four principles are: nonmaleficence, beneficence, autonomy, and justice. These four principles were selected to act as a culturally neutral ethical framework for medical professionals. The culturally neutral perspective was established on the notions that these four principles are understood and shared by every human cross-culturally (US Department of Health and Human Services 1979).

These principles have helped mitigate some problems within the medical field; however, they are not entirely effective. The universalist assumptions contained in these four principles have been determined to be false because these are heavily rooted in a Western cultural framework. For example, Chinese peoples rights of autonomy are not emphasized as much as in the Western world. Chinese people have traditionally kept negative news, like a terminal condition, from the patient because this knowledge is believed to be disheartening, while ignorance of the condition is viewed as better for the patient. The practice, however, contrasts with the principle of autonomy that declares it necessary to relay information, like information about a terminal condition, to the patient (Cheng 1998).

Muslim perspectives provide another example of how different cultures view end-of-life care. Among Muslims there is unconditional value given to human life. Thus any treatment, even painful and harmful treatments, are seen as beneficial if these can prolong life. The cultural perspective conflicts with the principle of nonmaleficence by causing harm to the patient. Furthermore, the Islamic faith places greater emphasis on beneficence than autonomy. Thus it is seen as more correct for medical staff to make decisions about life and death than the patient. This act protects the patient from making questionable choices and places the outcome in the hands of Allah (Westra 2009). Overall what these cultural perspectives reflect is how the four principles outlined in the Belmont Report can be interpreted in different manners and as a result conflicts can arise over these differing perspectives.

Since the four principles described above are not universally accepted, an antidote to the universalist assumptions of these principles has led to the creation of the "Eight Questions" by Arthur Kleinman. These questions were designed to establish points of dialogue between the patient, their relatives, and the medical staff charged with patient care in order to better inform treatment decisions for culturally diverse patients. Examples of questions include: "what do you think of your illness, why and when did it start, and what kind of treatment are you expecting?" These questions open up dialogue that allows for gaps to be bridged between ways that the medical staff and the patient understand the illness, which in turn creates an environment where more effective, culturally relevant treatments can be provided. This approach to care prevents or provides an opportunity to mitigate conflicts effectively (Fadiman 1997).

Conflict Resolution

As expressed by the above discussion, there are methods that can be employed to mitigate and deter conflicts caused by different perspectives on body care. Understanding the forensic procedure and the way it conflicts with different cultural beliefs is in itself a step towards conflict resolution (Renteln 2001). This suggests the need for the medical examiner to have a solid foundation of knowledge about the local demographics within which he/she works, because this will allow the medical examiner to make informed decisions. Additionally, this cultural knowledge will provide them with some insight about ways in which the forensic autopsy may conflict with the different groups they will be attending to. This knowledge can also be used as a means for opening communication channels as will be discussed shortly.

Conflicts can also be mitigated and prevented by maintaining an atmosphere of respect between the medical examiner and the families of the deceased. That is not to imply that medical examiners do not treat their cases in the most professional manner, but rather that it is important to remember there are culturally different manners people engage in to show respect to the dead (Taylor 2008). Ways in which more culturally relevant respect can be shown towards the dead include the following. At the conclusion of an autopsy, removed organs and tissues could be returned to the location in the body from which they were retrieved. In contrast to one instance where a medical examiner placed the removed brain in the convenient location of the chest cavity; the brain was later discovered by the family during funerary rites which led to an extensive legal battle because of alleged psychological damage inflicted upon the family (Burton 2010). Furthermore, respect can also be provided to the deceased's relations by providing them with information that is as accurate as the medical examiner is at liberty to disclose. Even if the state does not require the consent for retention of tissues and organs, being up front about such retention could prevent situations like the one described at the beginning of this paper (Leddy 2010).

The third and most important step that can be taken is active engagement with the deceased's relatives. As with the clinical perspective discussed above, channels of dialogue must be established concerning issues of after-death body-care, because it is through good communication that conflicts can best be prevented and resolved. It is important, however, to treat each engagement with families on a case by case basis, just as the examination is done case by case. This is important so practitioners do not engage the use of stereotypes about each cultural group as these can create their own flavor of problems. Also this interaction between the medical examiner and the family of the deceased should extend to the deceased's community. In fact, medical examiners should create communications networks between themselves and the community leaders of the different religious and cultural groups (Owens 2008). This would be helpful because these leaders may be able to help act as liaisons between the medical examiner and the deceased's relatives in order to help resolve potential conflicts.

To help open up the dialogue between the medical examiner and families, the following series of seven questions, similar in purpose and nature to those developed by Kleinman, might be used by medical examiners as points of departure. Because religious beliefs are personal and emotionally charged, it is important that all these

questions are asked with respect with the goal of attempting to build an understanding between the medical community and those affected by forensic autopsy.

Seven Questions for Mitigating Body-Care Conflicts

1. What religion do you or the deceased adhere to?

This straightforward question will allow the medical examiner to draw upon their established knowledge of the demographics and be able to apply those to the conversation.

2. How should the deceased be treated?

The answers to this question will most likely be provided in terms, such as "with respect" or "as sacred" but it is important to not assume specific meanings for these terms without additional inquiry because respect for the dead is understood differently. Instead, this question is designed to provide the medical examiner with a record of how the family understands these terms.

3. Is there a proper procedure for handling the deceased?

Unlike the above question, this question will provide information on the actual process that the family would like to see followed for the treatment of the dead. For example, a Muslim may express how the body needs to be oriented towards Mecca and never left alone.

4. How long after death should the funeral take place?

This question provides a time-frame for the autopsy as defined by the relatives and can be used in conjunction with the necessities of the forensic investigation.

5. How long does the soul/spirit take to leave the body?

The answers to this question will provide the medical examiner with information on the minimum time necessary for the body to become an empty shell according to the family's beliefs.

6. What do you think will happen during the examination?

This question will provide the medical examiner with the family's perspective of the autopsy and provide an opportunity for the medical examiner to dispel misconceptions about the procedure.

7. What do you fear about this procedure?

This question will provide the medical examiner with direct concerns the family maybe having about the autopsy and will provide a point of departure for dis-

cussion by the medical examiner to alleviate some of these fears.

Once communication has been opened, this will provide the opportunity for the medical examiner to build an understanding with the deceased's relatives about the examination procedure he/she will be conducting, while also allowing the relatives opportunities to voice their concerns with the procedure. For example, if the deceased was Buddhist, the medical examiner could discover through question six or seven that the family was worried the procedure would be conducted too early and think it might disrupt the deceased's concentration on attaining enlightenment. The medical examiner could draw upon their knowledge of Buddhism and wait to conduct the autopsy until after the three days had passed. Should it be critical to have a prompt autopsy as part of a criminal investigation, the medical examiner could suggest that the family have a priest come and help the spirit attain enlightenment and leave the body sooner, thus allowing the autopsy to take place within the mandated time-frame. These accommodations could leave the family satisfied and would avoid the psychological trauma that could have been inflicted had the autopsy taken place without consultation.

Conclusion

The conflicts that arise over different perspectives on after-death body-care among medical examiners and the public can be some of the most harrowing experiences for all parties involved. Not only can they place people into long drawn out legal battles, but they also can destabilize the ability of the medical examiner to conduct their job, while also potentially instilling intense anxiety on the deceased's families (Nath 2011). These conflicts however are manageable and can be mitigated or even prevented. Conflict mitigation can be accomplished by the medical examiner having demographic knowledge, showing culturally relevant respect for the deceased and their relatives, and by communicating with the family on issues of after-death body-care. Knowledge allows the medical examiner to make predictions about where autopsy may conflict with the community's beliefs and allow him/her to make informed decisions on ways to reduce these conflicts. Additionally, showing respect and opening communication over these issues will allow differences to be understood and gaps to be bridged. These together create an atmosphere where solutions to these conflicts can be created.

The dialogue that is opened will also create better rapport between the medical examiner and those of dif-

fering cultural perspectives. This will mitigate potential problems, create satisfaction for all parties and leave them, especially the families, with peace of mind about their loved ones. This rapport will also prevent the generation of negative stereotypes, by debunking the perception of families being disruptors and complainers and the medical examiners as villains who sneak in the dark waiting to defile the dead. Asking the questions posed above and opening dialogue between all parties will leave the community more trusting of medical examiners, thus allowing them to conduct their jobs. When the law and beliefs are both taken into consideration, the difficult job of conducting mandatory autopsies will be easier and the communities impacted by this procedure will be more open minded about it.

It is important to remember that the medical examiner is mandated by law to conduct autopsies under defined circumstances and that even with dialogue, conflicts will occur over the treatment of the dead. However, with open communication there is a greater chance that fewer conflicts will occur as differences will be able to be overcome. This paper has taken a new step towards resolving these conflicts, but it is imperative for the future that anthropologists and other scientists continue to investigate these sorts of conflicts in order to continue generating new and viable solutions to them and, in doing so, leave the world a little better off than it is now.

References

- Baer, Hans A., Merrill Singer, and Ida Suser
2003 *Medical Anthropology and the World System*. Westport, CT; Praeger Publishers.
- Bliatout, Bruce T.
1993 Hmong Death Customs: Traditional and Acculturated. *In* *Ethnic Variations in Dying, Death, and Grief*. D. P. Irish, ed. Pp 67-78. Taylor & Francis, Washington.
- Brokenleg, Martin
1993 Native Americans: Adapting, Yet Retaining Ethnic Variations. *In* *Ethnic Variations in Dying, Death, and Grief*. D. P. Irish, ed. Pp 101-112. Taylor & Francis, Washington.
- Burton, Elizabeth C.
2010 Religions and the Autopsy. *Medscape Reference: Drugs, Diseases, and Procedures*. <http://emedicine.medscape.com/article/1705993-overview#a30>, accessed September 20, 2011.
- Carpenter, Belinda
2011 Communicating with the Coroner: How Religion, Culture, and Family Concerns May Influence Autopsy Decision Making. *Death Studies* 35: 316-337.
- Cheng, F., Mary Ip, K.K. Wong, and W. W. Yan
1998 Critical Care Ethics in Hong Kong: Cross-Cultural Conflicts as East Meets West. *Journal of Medicine and Philosophy* 23(6):616-627.
- Cytron, Barry D.
1993 To Honor the Dead and Comfort the Mourners: Traditions in Judaism. *In* *Ethnic Variations in Dying, Death, and Grief*. D. P. Irish, ed. Pp 113-123. Taylor & Francis, Washington.
- Dorff, Elliot N.
2005 End-of-life: Jewish perspectives. *The Lancet* 366: 862-865.
- Fadiman, Anne
1997 *The Spirit Catches You and You Fall Down* (pp. 250-261). The Noon Day Press, New York.
- Falk, Catherine
2004 Hmong Instructions to the Dead: What the Mouth Organ Qeej Says (Part Two) *Asian Folklore Studies* 63(2): 167-220.
- Gilanshah, Farah
1993 Islamic Customs Regarding Death. *In* *Ethnic Variations in Dying, Death, and Grief*. D. P. Irish, ed. Pp 137-145. Taylor & Francis, Washington.
- Grimes, Ronald L.
1986 Desecration of the Dead: An Inter-religious Controversy. *American Indian Quarterly*, Fall: 305-317.
- Illinois Coroners and Medical Examiners Association
2005 *Forensic Autopsy Guidelines*. Illinois Coroners and Medical Examiners Association.
- Imhof, Arthur E.
1996 *An Ars Moriendi for Our Time: To Live a Fulfilled Life; to Die a Peaceful Death*. *In* *Facing Death*. H.M. Spiro, ed. Pp 114-120. Yale University Press, New Haven.
- Irish, Donald P.
1993 Memorial Services among Quakers and Unitarians. *In* *Ethnic Variations in Dying, Death, and Grief*. D. P. Irish, ed. Pp 147-159. Taylor & Francis, Washington.
- Kleinman, Arthur, Leon Eisenberg, and Bryon Good
2006 Culture, Illness, and Care: Clinical Lessons from Anthropologic and Cross-cultural research. *Journal of Lifelong Learning in Psychiatry*. 4 (1):140-149.
- Lapidus, Ira M.
1996 The Meaning of Death in Islam. *In* *Facing Death*. H.M. Spiro, ed. Pp 148-159. Yale University Press, New Haven.
- Leddy, Daniel
2010 The 'Right of Sepulcher' VS the Necessity of Autopsies. http://www.silive.com/opinion/danielleddy/index.ssf/2010/10/the_right_of_sepulchre_vs_the.html, accessed September 19, 2011.
- Midwest Medical Examiner's Office
2011 Investigation as Required by Law. Anoka County Government, Minnesota. http://www.co.anoka.mn.us/v3_medexam/investigation.html, accessed September 19, 2011.

Nath, Priya

2011 Medicolegal Issues and the Autopsy. Medscape Reference: Drugs, Diseases, and Procedures. <http://emedicine.medscape.com/article/1975045-overview>, accessed September 19, 2011.

National Association of Medical Examiners, and The College of American Pathologists

2003 Medical-Legal Death Investigation and Autopsy: Answers for Families and Friends. Forensic Pathology Resource Council.

Office of Chief Medical Examiner.

2011 Forensic Autopsy. Department of Health and Mental Hygiene, Maryland.

Owens, Christine W.

2009 Issues of Culture and the Role of the Medical Examiner. *Ethnomed.org*. University of Washington. <http://ethnomed.org/clinical/end-of-life/me-interview>, accessed April 5, 2010.

Ponet, James E

1996 Reflections on Mortality from a Jewish Perspective. *In* Facing Death. H.M. Spiro, ed. Pp 129-136. Yale University Press, New Haven.

Renteln, Alison D.

2001 The Rights of the Dead: Autopsies and Corpse Mismanagement in Multicultural Societies. *South Atlantic Quarterly* 100(4): 1005-1027.

Rispler-Chaim, Vardit.

1993 The Ethics of Postmortem Examinations in Contemporary Islam. *Journal of Medical Ethics* 19(3): 164-168.

State of New York .

2011 New York Code –Title 2: Autopsy and Dissection. State of New York.

Taylor, James S. and Aaron Spital.

2008 Corpses Do Not Have Rights: A Response to Baglow. *Mortality* 13: 282-286.

Truitner, Ken & Nga.

1993 Death and Dying in Buddhism. *In* Ethnic Variations in Dying, Death, and Grief. D. P. Irish, ed. Pp 125-136. Taylor & Francis, Washington.

US Department of Health and Human Services

1979 Belmont Report. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research.

Vatuk, Sylvia.

1996 The Art of Dying in Hindu India. *In* Facing Death. H.M. Spiro, ed. Pp 121-128. Yale University Press, New Haven.

Westra, Anna E., Dick L. Willems, and Bret J. Smit.

2009 Communicating with Muslim parents: “the four principles” are not as culturally neutral as suggested. *European Journal of Pediatrics* 168 (11): 1383-387.

BORN TO BE WIDE: RE-EVALUATING THE CLAIM THAT NEANDERTAL SKELETAL MORPHOLOGY IS AN AUTAPOMORPHIC CONDITION

CHRIS DAVIS

ABSTRACT

It is often posited that the wide bodies of Neandertals, characterized by broad trunks, wide pelves, and relatively short limbs, are an autapomorphic condition that arose primarily as an adaptation to life in cold climates in Pleistocene Eurasia (Rak and Arensburg 1987; Rak 1990; Ruff 1991; Holliday 1997a; Weaver 2003, 2009). This pattern has often been contrasted to the "long and linear" bauplan of modern humans, characterized by generally narrower body proportions and longer limbs, which is suggested to be the plesiomorphic condition for genus *Homo* (Ruff and Walker 1993; Ruff 1995, 2002). These ideas are based in large part on the initial reconstructions by Ruff and Walker (1993) of stature and body proportions in the 1.5 myo juvenile *Homo erectus* KNM-WT 15000 from Kenya. However, these reconstructions have recently been questioned by several authors who have concluded that KNM-WT 15000 would not have been as "long and linear" as initially proposed (Ohman et al. 2002; Graves et al. 2010). Furthermore, more recent fossil finds suggest that many early members of genus *Homo* possessed a wide body plan, composed of a suite of functionally related traits in the hip and trunk, regardless of geographical region (Ruff 1995; Arsuaga et al. 1999; Simpson et al. 2008; Walker et al. 2011). As such, it seems that Neandertals may have simply retained the plesiomorphic morphology of their earlier hominin ancestors, and it is possible that modern human morphology in fact represents the autapomorphic hominin condition.

Introduction

The distinctive "long and linear" body form typical of anatomically modern *Homo sapiens* (AMHS) is characterized by antero-posteriorly (A-P) wide and medio-laterally (M-L) narrow trunks and pelves, ilia with minimal lateral flare, short, stout pubic rami, long femora with shortened necks and high neck-shaft angles, and long limbs relative to body size (Ruff and Walker 1993; Ruff 1995; Holliday and Ruff 1997; Ruff 2002). Conversely, the wide and massive bodies typical of Neandertals exhibit M-L broad and A-P narrow trunks, M-L wide pelves with large bi-acetabular and bi-iliac distances, ilia with marked lateral flare, long, thin pubic rami, platymeric femora (A-P flattened just below the lesser trochanter with thickened cortical bone in the walls) with long necks and low neck-shaft angles, and limbs that are fairly short relative to body size (Rak and Arensburg 1987; Rak 1990; Holliday 1997; Weaver 2003; Weinstein 2008).

Currently, there is broad acceptance for the idea that the long and linear bauplan characteristic of modern humans evolved in Africa ~1.5 million years ago (mya) in early members of the *H. erectus* lineage and is therefore the plesiomorphic condition for genus *Homo* (Ruff 1995, 2002). Conversely, the wide bauplan of Neandertals is often posited as an autapomorphic charac-

ter state that evolved in response to cold climates, insufficient cultural buffering against them, heightened activity levels, and/or bioenergetic concerns (Holliday 1997; Franciscus and Churchill 2002; Weinstein 2008; Churchill 2008). Furthermore, based on the notion that "long and linear" is the plesiomorphic form for genus *Homo*, it is commonly proposed that Neandertals were a completely distinct species, which occupied their own dead-end branch of the hominin family tree and made little, if any, contribution to the modern human gene pool.

Much of this line of thought stems from the first reconstructions of stature and body breadth in KNM-WT 15000, the 1.5 million year old (myo) juvenile *H. erectus* from Kenya. In their original reconstruction of KNM-WT 15000, Ruff and Walker (1993) determined that he would have been ~160 cm tall and weighed ~48 kg at the time of his death. As an adult, they estimated he would have been ~185 cm and weighed ~68 kg. This led them to postulate that KNM-WT 15000 would have had long and linear body proportions, similar to those of modern humans from tropical regions (i.e., with overall narrow bodies and limbs that are long relative to body size). This is not surprising considering that they were working under the *a priori* assumption that all early African *Homo* had tropical body proportions and

therefore used regression equations based on modern tropical populations to produce their reconstructions (Ruff and Walker 1993). However, several authors have recently re-examined the original estimates, producing contradictory results (Graves et al. 2010; Ohman et al. 2002).

Ohman et al. (2002) note that the axial/appendicular disproportion observed in KNM-WT 15000 casts doubt on the stature estimates attained by Ruff and Walker (1993), who used only appendicular elements to obtain their estimates and did not account for this disproportion. They further point out that the regression equations employed by Ruff and Walker (1993) for stature prediction were based on a reference sample of individuals with body proportions unlike those of KNM-WT 15000. Taking into account the axial/appendicular disproportion and using estimates based on both appendicular and axial elements, they arrive at an estimate of ~141-147 cm for KNM-WT 15000 at the time of his death (Ohman et al. 2002), much shorter than the ~160 cm originally proposed by Ruff and Walker (1993).

Similarly, Graves et al. (2010) point to the fact that most reconstructions of KNM-WT 15000 have operated under the assumption that the life history of *H. erectus* would have basically been identical to that of modern humans. However, they posit that new research has suggested this may not be the case (a fact that was not lost on Smith, who noted a "somewhat uneasy fit...to human growth standards" (Smith 1993: 219) in her original estimation of the age of KNM-WT 15000). In order to re-evaluate previous estimates of his stature, they examine alternative life history trajectories and find that the one that most closely correlates with his perimortem development indicates that he would have stopped growing around the age of 12. Using this new life-history curve, they derive estimates of ~154 cm at death and ~163 cm as an adult (Graves et al. 2010), again much shorter than the original predictions.

The studies of Ohman et al. (2002) and Graves et al. (2010) suggest that KNM-WT 15000 may not have been as linearly proportioned as previously postulated, either at the time of his death or as an adult. If this is the case, it follows that previous interpretations (which are based in large part on him) regarding the plesiomorphic nature of the linear bauplan of AMHS and the autapomorphic nature of the wide bauplan of Neandertals are constructed, at least in part, on flawed information. This fact alone would appear to justify re-examination of these interpretations. However, this is not the only evi-

dence that earlier hominins, including other archaic *Homo*, may not have been linearly proportioned.

It is worth noting at this point that one of the original proponents of the idea that long and linear is the ancestral *Homo* condition has more recently backed off this position, suggesting that most early *Homo* probably had very wide bodies in many respects (Ruff 2010). Additionally, several authors have noted a body plan similar to that of Neandertals in archaic *Homo* after ~1.5mya, in both Africa and Eurasia (Rosenberg 2006; Simpson et al. 2008; Gomez-Olivencia et al. 2009, 2010), as well as in earlier African hominins (Rak 1991; Weaver 2003; Lovejoy et al. 2009). Over the past two decades, this morphological pattern, which is composed of functionally related features in the region of the hip and trunk, has been observed by a number of researchers. These features include M-L wide thoraces and pelves, and relatively short, platymeric femora with long necks and low neck-shaft angles (Rak 1991; Ruff 1995; Francis and Churchill 2002).

Coupled with the new interpretations of stature and body proportions in KNM-WT 15000, the presence of hominin fossils displaying many of the characters associated with a wide bauplan that are contemporary with, and both pre- and postdate, *H. erectus*, seems to suggest that a wide bauplan may represent the ancestral condition for genus *Homo* and perhaps earlier hominins as well. If this is the case, then it is possible that Neandertals simply retained the ancestral morphological pattern, and the arrival of AMHS on the scene some 200,000 years ago marks the first real departure from it. As such, a re-evaluation of the claim that long and linear is the plesiomorphic condition for genus *Homo* may very well be warranted.

It is important to clarify that the position being put forth here is not meant to suggest that the wide bodies of Neandertals were not advantageous in dealing with life in the glacial environments of Pleistocene Eurasia, because they no doubt were. It is simply suggesting that life in cold climates may not have been the primary selective pressure that drove the original appearance of this morphology. In this case, the wide bodies of Neandertals would not constitute a direct adaptation to cold climates, heightened activity levels, or bioenergetic concerns. Rather, they would simply represent a fortuitous exaptation that allowed them to successfully deal with the difficulties inherent in the ecosystems they inhabited (Gomez-Olivencia 2009). However, although these selective pressures may not have been the forces that drove the initial appearance of this morphology, they

are still the most likely explanation as to why the Neandertals retained (and developed an even more extreme form of) the plesiomorphic wide-bodied pattern (Weaver 2009).

The remainder of this paper will explore evidence in support of the idea that the wide bauplan of Neandertals is not an autapomorphic character state, but may in fact represent the ancestral condition for genus *Homo*. It will begin with a discussion of the morphological features of the upper leg, hip, and trunk (i.e., the body segments most relevant to discussions of body breadth and stature) that characterize Neandertals (as well as earlier hominins and other archaic *Homo*). Evidence for the first appearance of this morphological pattern in the hominin fossil record, as well as the functional significance of it, will be examined. Evidence for a similar morphological configuration in early *Homo* (after 2mya in Africa and Eurasia) will be explored as well. Finally, possible explanations for why a wide bauplan may have persisted for such a long period of hominin history, along with reasons why a reconfiguration of this bauplan may have been advantageous for AMHS, will be discussed.

It should be made clear at this point that the following discussion will be based solely on examination of previously published literature (scholarly articles and books) concerning fossil hominins, skeletal and muscular anatomy, and biomechanics. The intent of this paper is not to “prove” that the ancestral body plan for *Homo* was wide rather than long and linear. It is simply to explore the evidence available at this time that may lend support to this idea. In-depth quantitative analysis would be required before this notion could be posited with any sort of confidence and none will be provided here. However, before delving into any sort of in-depth metric analysis, it is important to determine whether or not evidence exists that may justify it. That is precisely what the current paper will attempt to do.

What makes a body “wide”?

As mentioned above, it has previously been recognized by a number of authors that Neandertals and earlier hominins were not linearly built (Ruff 1995; Holliday 1997; Franciscus and Churchill 2002). Furthermore, they possess a number of important postcranial morphological features that are fundamentally different from those of AMHS (Tague and Lovejoy 1986; Rak 1991; Ruff 1995). The following discussion of the morphological features that constitute a wide body plan will focus on features of the pelvis, femur, and thorax that have previ-

ously been posited to set Neandertals apart from other archaic *Homo*.

Neandertal pelvises are generally robust, transversely wide, and A-P rather narrow. They are also characterized by large bi-iliac and bi-acetabular breadths (Ruff 1995; Weaver 2003). A large distance between acetabulae in turn causes a M-L elongated, or platypelloid, shape of the pelvic inlet and necessitates long pubic rami, which in Neandertals are quite thin in cross-section (Rak and Arensburg 1987; Weaver 2003). The ilia face coronally and display marked lateral flare (Rak and Arensburg 1987; Ruff 1995; Weaver 2003).

The femora of Neandertals are short relative to body size, quite robust, and have large heads relative to their length (Weaver 2003). As a consequence of the large bi-acetabular distance, they have long necks with low neck-shaft angles, which are reinforced by proximal shafts that are A-P flattened, M-L wide, and have lateral walls with thick cortical bone (i.e., platymetric) (Buxton 1938; Ruff 1995; Weaver 2003). The femoral shafts often display a large amount of A-P curvature (Shackelford and Trinkaus 2002).

The large thoraces of Neandertals have been described as “hyper-barrel-shaped” (Franciscus and Churchill 2002; Weinstein 2008; Gomez-Olivencia et al. 2009), and though they seem to follow the basic human morphological pattern, there are some readily discernible differences. The ribs are typically larger and more rounded, which creates a larger inferior circumference of the chest (Franciscus and Churchill 2002; Gomez-Olivencia et al. 2009). Also, the ribs are typically more rugged-looking than those of modern humans (Franciscus and Churchill 2002). In any case, what is important here is that the chests of Neandertals are transversely wide (a consequence of the fact that the dimensions of the trunk must match those of the pelvis [Bruce Latimer, personal communication]) and quite voluminous (Gomez-Olivencia et al. 2009).

As was briefly mentioned earlier, many of the features discussed above which have been posited as autapomorphies in Neandertals are part of a suite of traits that are all functionally related to one another. In other words, they are part of an integrated morphological package, the appearance of which seems to directly correspond with the emergence of upright, bipedal locomotion. The following section will focus on the functional properties of this morphological package and examine how each of the traits involved is instrumental in allowing the system as a whole to operate properly.

The functional significance of wide bodies

Lovejoy et al. (2009) note that M-L broad and laterally flared ilia are related to a repositioning of the anterior gluteal abductors, muscles that play a prominent role in stabilization when standing or moving on two legs (Sigmon 1975). In the African apes, the ilia are elongated cranio-caudally (Tague and Lovejoy 1986), and only gluteus medius and gluteus minimus attach directly to them (Sigmon 1975). In upright hominins, on the other hand, all of the gluteals have prominent attachment sites directly on the ilia, and gluteus medius and minimus are shifted laterally for better control of balance (Sigmon 1975). Therefore, the ilia must be M-L broad and laterally flared in order to accommodate the attachment of these muscles.

Assuming a more ape-like common ancestor, it appears that the initial increase in M-L breadth and lateral flare of early hominin ilia would have stemmed from the need to reconfigure an ape-like pelvis into one better equipped to facilitate upright posture and locomotion. Furthermore, as hominins continued to evolve, they began to get larger and to rely more exclusively on bipedal locomotion. As such, it seems logical that the original M-L expansion of the pelvis would have continued, eventually producing the large bi-acetabular distances and platypelloid pelvis characteristic of Neandertals and other early hominins.

It should be borne in mind that the structure of anatomical components is directly related to their function (Tague and Lovejoy 1986), and a platypelloid pelvis is certainly well-suited to perform many of the major postural, locomotor, and obstetric requirements of the pelvic girdle. However, from a biomechanical standpoint, it is also a disadvantage because during upright walking an increase in the distance between acetabulae elongates the load arm of the abductors (Arsuaga et. al 1999), amplifies abductor and joint reaction forces and bending moments in the hip (Ruff 1995), increases vertical displacement of the hip (Rak 1991), and causes the need for a decreased femoral neck-shaft angle (Buxton 1938). These are all problems that must be dealt with in order to keep the locomotor apparatus functioning properly. The early hominin solution to these problems was achieved through a combination of lateral iliac flare, and platymeric femora with long necks (Buxton 1938; Rak 1991; Ruff 1995; Arsuaga et. al 1999).

When combined with a large bi-acetabular breadth, the extreme lateral flare of the ilia plays an important role in bipedal posture and locomotion. It stabilizes the center of mass and reduces its vertical drop (Rak 1991). It also

straightens the line of action of the abductors (Arsuaga et. al 1999). In turn, a long femoral neck provides added support by increasing the distance between the proximal ends of the femoral diaphyses (Rak 1991) and decreasing the loading forces exerted on the hip joints and abductors (Ruff 1995). However, the decrease in the femoral neck-shaft angle that accompanies the elongation of the neck reduces its structural integrity and increases the risk of it shearing (Buxton 1938). This increased risk of shearing is compensated for by femoral platymeria. In platymeric femora the proximal shaft is compressed in the A-P direction and the cortical bone in the medial and lateral walls is quite thick. As such, a platymeric femur provides additional reinforcement in the weakened areas of the neck and proximal shaft. Taken together, all of the features discussed above produce a functional and efficient system for habitual bipedal locomotion.

It has now been established that many of the morphological characters that constitute a wide bauplan are part of a system related to locomotion and concentrated about the region of the hip (Ruff 1995; Richmond and Jungers 2008). It was also noted that to maintain the functional integrity of the entire body the dimensions of the thorax must scale to meet those of the pelvic girdle (Bruce Latimer, personal communication). In other words, the wide trunks of Neandertals were necessitated, at least in part, by the fact that they had transversely wide pelvises. Attention will now be turned to an examination of the fossil record in order to determine whether evidence of a wide body plan can be found in other early hominins, including archaic *Homo*.

The fossil evidence for wide bodies

Mio-Pliocene hominins

Richmond and Jungers (2008) report that the femora of BAR 1002'00, a ~6myo specimen of *Orrorin tugenensis* from Kenya, have long necks and M-L broad (i.e., platymeric) proximal shafts. They further add that this individual would have also had ilia that were transversely broad and very laterally flared (Richmond and Jungers 2008). In their analysis of the pelvis and femur of "Ardi" (ARA-VP-6/500), the ~4myo *Ardipithecus ramidus* from Ethiopia, Lovejoy et al. (2009) note that the ilium of this specimen is M-L broad and exhibits lateral flaring. They also point out that her superior pubic ramus is elongated. Considering the fact that many of the traits which constitute a wide bauplan are necessitated by the others, it does not seem unreasonable to suggest that more complete remains of both *O. tugenensis* and *Ar. ramidus*

would likely display many of the characters associated with this anatomical configuration.

A similar pattern of morphological characters has been recognized in the australopithecines as well. Weaver (2003) notes that all three reconstructions of the ~2.5 myo pelvis of Sts-14 (*Australopithecus africanus*) from South Africa have produced a transversely wide (platypelloid) aperture. Similarly, the much more complete skeleton of "Lucy", the famous 3.2 myo *Au. afarensis* from Ethiopia, exhibits the typical physique of a wide-bodied individual. She has a platypelloid pelvis with laterally flared ilia, a broad, "bell-shaped" thorax, short femora with long necks, and relatively short lower limbs (Tague and Lovejoy 1986; Rak 1991).

Early Homo

KNM-ER 3228 (*H. ergaster*, Kenya ~1.95mya)

The fragmented right innominate of KNM-ER 3228, from the Late Pliocene in Kenya, represents one of the oldest relatively complete hominin hip bones known to date (Weaver 2003). Interestingly, it displays several of the morphological features listed above that characterize Neandertals. Like Neandertals, the ilium of this specimen is oriented coronally and exhibits obvious lateral flaring. It also has a large acetabulum, which can only be presumed to have been for the accommodation of a large femoral head (Weaver 2003).

KNM-WT 15000 (*H. erectus*, Kenya ~1.5mya)

KNM-WT 15000 has ilia that are laterally flared and femora with long necks and low neck-shaft angles (Brown et al. 1985; Trinkaus et al. 1999). He also exhibits a large thoracic volume (although this is achieved in a somewhat different manner than in Neandertals) and elongated pubic rami (suggesting a similarly constructed pelvis). A narrow bi-acetabular distance has been reported for KNM-WT (Brown et al. 1985; Franciscus and Churchill 2002) on more than one occasion. However, a number of authors, noting his youth and possible pathological condition, have raised the possibility that these reports could simply be erroneous (Arsuaga et al. 1999; Franciscus and Churchill 2002).

BSN49/P27 (*H. erectus*?, Ethiopia ~1.4mya)

Although the taxonomic status of this individual has been the subject of much debate (Ruff, 2010), the original authors classified it as *H. erectus*, and that remains the current published designation (Simpson et al., 2008). In any case, this transversely broad pelvis most likely belonged to a "short-statured, broad-hipped" female

(Simpson et al. 2008). It displays an extremely large bi-acetabular distance, laterally flared ilia, and long pubic rami. The fact that the dimensions of the trunk must match those of the pelvic girdle indicates that she would also have had a capacious thorax. Further, the authors note that this individual does not exhibit any of the pelvic features and/or locomotor adaptations characteristic of AMHS. They conclude that she would not have been linearly proportioned, but instead would have had the body proportions typical of cold-adapted modern humans (and Neandertals) (Simpson et al. 2008).

TD6 (*H. antecessor*, Spain [minimum age] 530kya)

Results of analyses of the nine ribs of this specimen from Gran Dolina in the Sierra de Atapuerca have so far provided insufficient evidence in order to either confirm or refute the hypothesis that *H. antecessor* had large chests (Gomez-Olivencia et al. 2010). However, Gomez-Olivencia et al. (2010) suggest that other associated skeletal elements indicate this is likely the case, pointing to a particularly long adult clavicle recovered at the site. They conclude that the individual to whom the clavicle belonged would likely have had a broad, voluminous trunk, similar to those of Neandertals (Gomez-Olivencia et al. 2010). While this evidence is not conclusive, it certainly does not hurt the argument that wide bodies may be plesiomorphic in *Homo*.

OH28 (*H. erectus*, Tanzania ~500kya)

This specimen is composed of the left femoral shaft and associated partial left innominate (missing the pubic bone) of an individual that was most likely female (Day 1971; Leakey 1971). The innominate is stoutly built and remarkably robust. The acetabulum is large (suggesting a large femoral head) and the ilium exhibits extreme lateral flaring (Day 1971; Ruff and Walker 1993). The femora are markedly platymeric and the cortical bone lining the walls of the shafts is rather thick (Day 1971).

Berg Aukas (archaic *Homo*, Namibian Middle/Late Pleistocene)

Although the exact age of this femur is not known, morphological comparisons to other archaic *Homo* femora suggest that it most likely dates to sometime in the Middle or Late Pleistocene (Grine et al., 1995; Trinkaus et al., 1999). Grine et al. (1995) point out that the most remarkable feature of this femur is its extremely large head, which is matched in absolute size only by a handful of Neandertals (specifically, Spy 2 and La Ferrassie 1) and a few other archaic *Homo* specimens. Although the neck is

rather short and stocky, it nonetheless possesses one of the lowest neck-shaft angles known to date in a non-pathological hominin femur (Trinkaus et al., 1999). The proximal shaft is platymeric and the cortical bone of the shaft walls is thick (Grine et al., 1995).

Jinniushan (archaic *Homo* sp., China ~260kya)

The Jinniushan specimen from northern China represents one of the absolutely largest female hominins known to date (Rosenberg et al., 2006). She exhibits a very broad trunk and short limbs relative to body size. Like the Gona female (BSN49/P27), she is described as displaying the body proportions typical of cold-adapted modern humans from high altitudes. She has a platypelloid pelvis (although to a lesser degree than in some other archaic *Homo* pelvises) and an extraordinarily large bi-iliac distance (Rosenberg et al., 2006).

Pelvis 1 (archaic *Homo*, Spain ~200kya)

This nearly complete Middle Pleistocene male pelvis comes from Sima de los Huesos in the Sierra de Atapuerca. It is robust and platypelloid in form. It has laterally flared ilia, long pubic rami, and extremely large bi-iliac and bi-acetabular distances. It was found in association with two partial femora believed to belong to the same individual, both of which have long necks (Arsuaga et al., 1999). Arsuaga et al. (1999) posit that platypelloid pelvises and long femoral necks (along with other features typical of wide-bodied individuals) are probably plesiomorphic and that a narrow pelvis is likely an autapomorphy unique to modern humans (Arsuaga et al., 1999).

So, where does this leave us?

The evidence for early hominins (other than Neandertals) with morphological features indicating a wide body plan now appears to consist of at least twelve individuals who span a vast geographic and temporal range from the Miocene in Kenya (~6mya) up through the Late Pleistocene of Europe and Asia (~200kya). Considering the relatively scant nature of well-preserved postcrania in the hominin fossil record, especially with regard to complete (or relatively complete) elements of the hip and trunk, the size of this sample is actually not that bad.

It is true that, for a number of the fossils discussed above, it cannot be unequivocally demonstrated that they possessed the entire suite of characters that constitute a wide bauplan. The only claim that can be made with absolute certainty is that they possessed at least

one or a few of the morphological features typical of wide-bodied individuals. However, it seems likely this is merely a consequence of the fact that not all of the relevant skeletal material was preserved and/or recovered. As many of the anatomical features that constitute a wide bauplan have been shown to be part of a functional package (Ruff, 1995; Richmond and Jungers, 2008), the presence of one or a few of these features raises the distinct possibility that the others (or many of them, at least) would have been present as well. As such, it is not beyond reason to suggest that each of these individuals may have been wide-bodied, albeit some (i.e., Middle/Late Pleistocene archaic *Homo*) probably to a greater degree than others (i.e., earlier hominins).

It is now of interest to explore possible explanations as to why a wide bauplan (that, remember, was in many ways biomechanically disadvantageous) would have persisted for such a long period of hominin history. Furthermore, why would a reconfiguration of this bauplan have been selected for among AMHS, but not their evolutionary forebears? Once again, for the following discussion, it is important to remember that structure of anatomical elements is directly related to their function and that the functions of the pelvis are related to posture, locomotion, visceral support, and birth (Tague and Lovejoy, 1986).

Why did wide bodies endure?

Following the initial reconfiguration of the early hominin pelvis in response to locomotor requirements, one of the primary selective pressures on pelvic form was likely related to accommodation and support of the viscera (Tague and Lovejoy, 1986). A platypelloid pelvis (and the wide trunk that comes with it) would certainly have provided a satisfactory solution that allowed for relatively efficient bipedal locomotion and provided adequate housing for the viscera. However, the M-L wide pelvises of the earliest hominins may also have presented obstetrical problems for them to deal with (Tague and Lovejoy, 1986).

Several authors have previously postulated that australopithecines and other early hominins would have had a birthing mechanism different from that of AMHS (Tague and Lovejoy, 1986; Ruff, 1995). Birth in modern humans is rotational, meaning that the fetus enters the pelvic inlet in one position and must then reorient itself while in the pelvic midplane in order to pass through the outlet (the M-L narrowest part of the birth canal) without becoming stuck and/or injured (Tague and Lovejoy, 1986; Ruff, 1995; Walrath and Glantz, 1996). The

M-L wide pelves of early hominins, however, would likely have required a non-rotational form of childbirth during which the fetus enters, passes through, and leaves the birth canal without changing its orientation (Tague and Lovejoy, 1986). Assuming a form of non-rotational birth, a platypelloid pelvis would have been well-suited to perform all of the major functions required of it.

It is important to remember that being evolutionarily fit does not require a “perfect” solution to a problem, it only requires one that works well enough to allow an individual to survive and enjoy differential reproductive success. It appears plausible that as the earliest hominins underwent drastic changes in both body form and behavior during the Mio-Pliocene, and into the Pleistocene, a platypelloid pelvis was simply an appropriate compromise, because it performed all of the functions required of it reasonably well (Tague and Lovejoy, 1986). This condition may have subsequently been passed down through the hominin lineage until at some point (possibly around the time of the first appearance of AMHS) it became evolutionarily advantageous to reconfigure it.

If it ain't broke, don't fix it!!

It seems reasonable that the presence of wide bodies in the fossil record of early *Homo* is a reflection of the fact that they simply retained a plesiomorphic morphological pattern, because it adequately performed all the functions required of it. In other words, they may have inherited from earlier hominins a wide bauplan that worked well enough for them to survive and enjoy differential reproductive success. Furthermore, it likely would have provided something of an advantage in many cases, such as among Neandertals or other archaic *Homo* living in middle- or high-latitude, colder environments. As such, it seems unlikely that there would have been any real selective pressure to greatly alter this original form. This may account for the fact that, for a period of ~4-5my one of the only major alterations to this body plan appears to have been the exaggeration of it as hominins got larger during the Late Pliocene and Early/Middle Pleistocene.

By the Pleistocene most archaic *Homo* species were beginning to get much larger and it was during this period that overall body size in *Homo* likely reached its apex (Ruff and Trinkaus, 1997; Rosenberg et al., 2006). This increase in size would likely have amplified many of the biomechanical issues associated with a wide bauplan and driven the development of a more extreme form of the wide-bodied condition in genus *Homo*. Specifically, the increased mass of Pleistocene *Homo* would have necessitated further increases in bi-acetabular distance (and the

corresponding increased M-L expansion of the chest), femoral neck length, femoral platymeria, and lateral flare of the ilia, in order to maintain the functional integrity of the hip and pelvis (Ruff, 1995).

By the Middle Pleistocene, the bodies of archaic *Homo* were probably M-L expanded to the furthest extent biomechanically possible (Ruff, 1995). In other words, by this time, any further M-L expansion of the hip and trunk of early *Homo* would have resulted in a loss of functionality. With respect to the idea that long and linear is an autapomorphic character state unique to modern humans, it is interesting that the wide bodies of archaic *Homo* reached their functional apex around the same time as the first appearance of AMHS and the body form that typifies them. The correlation of these events leads to rather obvious speculation that something happening around this time may have driven selection for a fundamentally different form, which eventually became the predominant body type among modern humans.

Why “long and linear”?

It is generally well accepted that the last major increase in encephalization in genus *Homo* occurred between ~600-200kya during the Middle and Late Pleistocene (Ruff, 1995; Rosenberberg et al., 2006). This was followed by a period of morphological stasis that lasted from ~200-50kya, and then a general trend of reduction in body size over the past 50ky or so (Ruff et. al, 1997, Rosenberg et. al, 2006). If the plesiomorphic form for genus *Homo* was in fact not “long and linear”, it seems likely that the replacement of the ancestral wide bauplan as the predominant condition in genus *Homo* would have been related to events taking place during this time.

Ruff (1995) posits that the platypelloid shape of archaic *Homo* pelves suggests that, like australopithecines and earlier hominins, they too had a non-rotational form of birth. Further, he suggests that sometime during or after the transition to rotational birth, bi-acetabular distance began to decrease and many of the features related to a wide body plan disappeared (Ruff, 1995). If this is the case, then it seems plausible that as infant head size increased during the Pleistocene, an A-P widening and M-L narrowing of the pelvis may have been selected for among the earliest modern humans and their ancestors in order to get large-brained babies into the birth canal with less difficulty. Once inside the birth canal, the mechanism of rotational birth would have allowed for reorientation of the baby in a manner that then allowed it to pass through the pelvic midplane and very narrow pelvic outlet.

However, this explanation does not account for the fact that Neandertal crania were on average larger than those of modern humans. It seems unlikely that pelvises that could accommodate the large neonates of Neandertals would somehow not have been of adequate size and/or shape to allow for the safe passage of modern human infants through the birth canal as well. Furthermore, previous authors have posited that there is no reason to assume that Neandertals (or other archaic *Homo*) had a birthing mechanism radically different from that of modern humans (Walrath and Glantz, 1996). As such, it remains to be seen whether body proportions and/or pelvic form in modern humans was in fact driven to some extent by increased encephalization.

Weinstein (2008) suggests that the extremely large chests and wide bodies of Neandertals (and by association, other archaic *Homo*) are likely due, at least in part, to heightened daily activity levels. If this is the case, then it is also possible that changes in body form in AMHS were brought on by a reduction in the daily amount of strenuous physical activity, possibly due to technological improvements that allowed them to better cope with their environments. However, this idea works (at least in part) under the assumption that Neandertals did not have the capacity to produce similar technologies and were therefore forced to cope with their surroundings primarily through anatomical adaptations. While this may have been the case for earlier hominins, there again seems to be no specific reason to *a priori* assume that Neandertals were not capable of effectively dealing with their surroundings in much the same way as modern humans.

The fact that Neandertals were likely able to deal with their environments in a manner similar to modern *H. sapiens* does not necessarily refute the idea that reduced activity levels and/or technological advances may have played a role in selecting for smaller, narrower bodies. It may be the case that, while Neandertals were able to cope with their environments just as well as modern humans, they simply retained the plesiomorphic wide bauplan because it worked for them. In this scenario, improvements in technology could still very well be at least part of the reason for the shift to the modern body proportions. However, this too remains to be conclusively demonstrated. Whatever the case may be, for the present discussion it must suffice to say that there are a number of possible explanations for the nature and timing of the shift to smaller, narrower bodies. None of these are necessarily mutually exclusive and, at present, all appear to have their shortcomings.

Where do we go from here?

The evidence presented above certainly appears to raise the possibility that the wide bauplan of Neandertals may not be as unique a character state as has been previously posited. If the "long and linear" form evolved in *H. erectus* by ~2mya, then it is certainly puzzling that many of the oldest and most complete postcranial fossils of African *Homo* (i.e., KNM-ER 3228; KNM-WT 15000; BSN49/P27) appear to suggest the opposite. Furthermore, as one of the most commonly proposed reasons for Neandertal morphology is adaptation to cold temperatures at high latitudes, the fact that many of the individuals who exhibit a similar anatomical pattern lived in tropical, semi-tropical, or temperate climates at lower latitudes requires explanation.

The fact that the rearrangement and narrowing of the modern human axial skeleton appears to directly correlate with the general disappearance of the wide bauplan is also certainly worth exploring further. While several authors have previously speculated as to the significance of this correlation, it has been shown that there is by no means a consensus on the matter. The same is true of myriad other issues related to body size and proportions in Pleistocene *Homo*. These issues should provide plentiful fodder for future work as the discussion of what is plesiomorphic and what is not with regard to body size and proportions in genus *Homo* continues to evolve.

References

- Arsuaga, J.L., C. Lorenzo, J.M. Carretero, A. Gracia, I. Martinez, N. Garcia, J.M. Bermudez de Castro, and E. Carbonell
1999 A Complete Human Pelvis from the Middle Pleistocene of Spain. *Nature* 399(6733):255-58.
- Bermudez de Castro, J.M., J.L. Arsuaga, E. Carbonell, A. Rosas, I. Martinez, and M. Mosquera.
1997 A Hominid from the Lower Pleistocene of Atapuerca, Spain: Possible Ancestor to Neandertals and Modern Humans." *Science* 276 (5317):1392-95.
- Brown, F., J. Harris, R. Leakey, and A. Walker
1985 Early *Homo Erectus* Skeleton from West Lake Turkana, Kenya. *Nature* 316:788-92.
- Buxton, L.H.D.
1938 Platymeria and Platycnemia. *Journal of Anatomy* 73(1):31-36.
- Carretero, J.M., C. Lorenzo, and J.L. Arsuaga
1997 Axial and Appendicular Skeleton of *Homo Antecessor*. *Journal of Human Evolution* 37(3-4):459-99.
- Chapman, Tara, Fedor Moiseev, Victor Sholukha, Stéphane Louryan, Marcel Rooze, Patrick Semal, and Serge Van Sint Jan
2010 Virtual Reconstruction of the Neandertal Lower Limbs with an

Estimation of Hamstring Muscle Moment Arms. *Comptes Rendus Palevol* 9(6-7):445-54.

Churchill, S.E.

2008 Bioenergetic Perspectives on Neanderthal Thermoregulatory and Activity Budgets. *In* Neanderthals Revisited: New Approaches and Perspectives. K. Havarti and T. Harrison, eds. Pp. 113-34. Berlin: Springer.

Day, M.H.

1971 Postcranial Remains of *Homo erectus* from Bed IV, Olduvai Gorge, Tanzania. *Nature* 232:383-387.

Franciscus, R.

2002 The Costal Skeleton of Shanidar 3 and a Reappraisal of Neandertal Thoracic Morphology. *Journal of Human Evolution* 42(3):303-56.

Gómez-Olivencia, A., K. L. Eaves-Johnson, R.G. Franciscus, J.M. Carretero, and Juan Luis Arsuaga

2009 Kebara 2: New Insights Regarding the Most Complete Neandertal Thorax. *Journal of Human Evolution* 57(1):75-90.

Gómez-Olivencia, A., J.M. Carretero, C.L., J.L. Arsuaga, J.M. Bermúdez de Castro, and E. Carbonell

2010 The Costal Skeleton of *Homo Antecessor*: Preliminary Results. *Journal of Human Evolution* 59(6):620-40.

Graves, R.R., A.C. Lupo, R.C. McCarthy, D.J. Wescott, and D.L. Cunningham

2010 Just How Strapping Was KNM-WT 15000? *Journal of Human Evolution* 59(5):542-54.

Grine, F.E., Jungers, W.L., Tobias, P.V., & Pearson, O.M.

1995 Fossil *Homo* Femur From Berg Aukas, Northern Namibia. *American Journal of Physical Anthropology* 97(2):151-185

Holliday, T.W.

1997a Postcranial Evidence of Cold Adaptation in European Neandertals. *American Journal of Physical Anthropology* 104(2):245-58.

1997b Body Proportions in Late Pleistocene Europe and Modern Human Origins. *Journal of Human Evolution* 32(5):423-47.

Holliday, T.W., and C.B. Ruff

1997 Ecogeographical Patterning and Stature Prediction in Fossil Hominids: Comment on M.R. Feldesman and R.L. Fountain. *American Journal of Physical Anthropology* (1996)100:207-224. *American Journal of Physical Anthropology* 103(1):137-40.

Kennedy, G.E.

1983 Some Aspects of Femoral Morphology in *Homo Erectus*. *Journal of Human Evolution* 12(7):587-616.

Leakey, M.D.

1971 Discovery of Postcranial Remains of *Homo erectus* and Associated Artefacts in Bed IV at Olduvai Gorge, Tanzania. *Nature* 232:380-383

McHenry, Henry M., and Robert S. Corrucini

1978 The Femur in Early Human Evolution. *American Journal of Physical Anthropology* 49(4):473-88.

McHenry, H.M.

1992 Body Size and Proportions in Early Hominids. *American Journal of Physical Anthropology* 87(4):407-31.

Ohman, J.C., C. Wood, B. Wood, R.H. Crompton, M.M. Gunther, L. Yu, R. Savage, and W. Wang

2002 Stature-at-Death of KNM-WT 15000. *Human Evolution* 17(3-4):129-41.

Rak, Y.

1990 On the Differences between Two Pelvises of the Mousterian Context from the Qafzeh and Kebara Caves, Israel. *American Journal of Physical Anthropology* 81:323-32.

1991 Lucy's Pelvic Anatomy: Its Role in Bipedal Gait. *Journal of Human Evolution* 20(4):283-90.

Rak, Y., and B. Arensburg

1987 Kebara 2 Neandertal Pelvis: First Look at a Complete Inlet. *American Journal of Physical Anthropology* 73:227-31.

Richmond, Brian G., and William L. Jungers

2008 *Orrorin tugenensis* Femoral Morphology and the Evolution of Hominin Bipedalism. *Science* 319:1662-1664

Rosenberg KR

2002 Birth, obstetrics and human evolution. *BJOG: an International Journal of Obstetrics and Gynaecology* 109:1199-1206.

2006 Body Size, Body Proportions, and Encephalization in a Middle Pleistocene Archaic Human from Northern China. *Proceedings of the National Academy of Sciences* 103(10):3552-56.

Ruff, Christopher B.

1991 Climate and Body Shape in Hominid Evolution. *Journal of Human Evolution* 21(2):81-105.

1995 Biomechanics of the Hip and Birth in Early Homo. *American Journal of Physical Anthropology* 98(4):527-74.

2000 Body Size, Body Shape, and Long Bone Strength in Modern Humans. *Journal of Human Evolution* 38(2):269-90.

2002 Variation in Human Body Size and Shape. *Annual Review of Anthropology* 31(1):211-32.

2010 Body size and body shape in early hominins – Implications of the Gona pelvis. *Journal of Human Evolution* 58(2):166-178

Ruff, C.B., and A. Walker

1993 Body size and body shape. *In* Nariokotome *Homo erectus* Skeleton. A. Walker and R. Leakey, eds. Pp. 234-265. Cambridge: Harvard University Press.

Ruff, C.B., E.Trinkaus, and T.W. Holliday

1997 Body Mass and Encephalization in Pleistocene *Homo*. *Nature* 387(6629):173-76.

Shackelford, L.L., and E. Trinkaus

2002 Late Pleistocene Human Femoral Curvature. *American Journal of Physical Anthropology* 118:359-370

Sigmon, B.A.

1975 Functions and Evolution of Hominoid Hip and Thigh Musculature. *In* Primate Functional Morphology and Evolution. R. Tuttle, ed. Pp. 235-252. The Hague: Mouton Publishers.

Simpson, S.W., J. Quade, N.E. Levin, R. Butler, G. Dupont-Nivet, M. Everett, and S. Semaw

2008 A Female *Homo Erectus* Pelvis from Gona, Ethiopia. *Science* 322(5904):1089-92.

Smith, B.H.

1993 The Physiological Age of KNM-WT 15000. *In* Nariokotome *Homo erectus* Skeleton. A. Walker and R. Leakey, eds. Pp. 195-220. Cambridge: Harvard University Press.

Tague, R.G., and C.O. Lovejoy

1986 The Obstetric Pelvis of A.L. 288-1 (Lucy). *Journal of Human Evolution* 15(4):237-55.

Tompkins, Robert L., and Erik Trinkaus

1987 La Ferrassie 6 and the Development of Neandertal Pubic Morphology. *American Journal of Physical Anthropology* 73(2):233-39.

Trinkaus, Erik

1993 Femoral Neck-Shaft Angles of the Qafzeh-Skhul Early Modern Humans, and Activity Levels among Immature near Eastern Middle Paleolithic Hominids. *Journal of Human Evolution* 25(5):393-416.

2006 Modern Human vs. Neandertal Evolutionary Distinctiveness. *Current Anthropology* 47(4):597-610.

Trinkaus, Erik, Christopher B. Ruff, and Glenn Conroy

1999 The Anomalous Archaic *Homo* Femur From Berg Aukas, Namibia: A Biomechanical Assessment. *American Journal of Physical Anthropology* 110:379-391

Weaver, T. D.

2003 A Multi-Causal Functional Analysis of Hominid Hip Morphology. PhD. Dissertation. Stanford University.

2009 The Meaning of Neandertal Skeletal Morphology. *Proceedings of the National Academy of Sciences* 106(38):16028-33.

Weinstein, K.J.

2008 Thoracic Morphology in near Eastern Neandertals and Early Modern Humans Compared with Recent Modern Humans from High and Low Altitudes. *Journal of Human Evolution* 54(3):287-95.

FIRST-GENERATION COLLEGE ATTENDANCE: THE MOTIVATIONAL PROCESS

SCARLETT EISENHAUER

"Being a first-generation college student makes you more driven. It makes you want to have things in life you never thought you were able to have... It makes you want to be financially stable, it makes you want to be independent from your parents, it makes you want to give back to those that have helped support you." (First-Generation Student)

Introduction

College's populations are increasingly composed of students from ethnic minorities and at-risk backgrounds. Many of these are first-generation students (Pascarella et al., 2004). Pascarella, Pierson, Wolniak and Terenzini (2004: 205) state that: "First-generation college students tend to be at a distinct disadvantage with respect to basic knowledge about postsecondary education, level of family income and support, educational degree expectations and plans, and academic preparation in high school." In addition, the authors state these students are culturally and socially more inclined to have a harder transition into college than comparable counterparts: middle class students whose parents and even grandparents have completed college. First-generation students are also more likely to drop out of a four year institution after the first year and are less likely to go on to graduate studies (Pascarella et al., 2004). The at-risk disposition of these students is not just an individual, but also an institutional problem. Understanding first-generation students' motivation and how the drive to get to college developed, may give insight into protective factors (positive influences that may reverse the negative influences) for success in the school system.

In this study, I wish to examine the underlying factors concerning motivation of first-generation college students. How or why do some children from at-risk groups make choices that enable them to succeed academically? Further, are there unique features of being a first-generation student in college that transcend the boundaries of cultural differences? Are the different motivational factors related to college choice influenced by culture? How were these students motivated to make it as far as they have? Is intrinsic motivation (motivation due to personal desires) a key factor, or is it not important in beating the statistical odds?

The nature of motivation is a concern in education and psychology. However, cultural and sociological factors should not be overlooked in the study of motivation.

Academic intrinsic motivation has been described as "enjoyment of school learning characterized by an orientation toward mastery, curiosity, persistence... and the learning of challenging, difficult, and novel tasks" (quoted in Marcoulides et al., 2008: 411). Children who display intrinsic motivation have done better in school and show less anxiety than their peers who might seem to lack motivation and are thus, "motivationally at risk." These children do consistently worse academically and are less likely to attend college. Camburn's (1999) longitudinal study showed that 11.8% of the motivationally at-risk group dropped out of high school (Marcoulides et al., 2008). The importance of motivation to academic success drives us to ask: Where does motivation come from?

A behavioral approach suggests that motivation is merely the alteration of the reinforcing value of an environmental stimulus. Richard Malott (2008) uses the term "motivating operation" to describe a condition that affects an organism's learning and performance with respect to a particular reinforcer which can be traced back to biological needs. Using Malott's definition, academic motivation rests on biological needs.

Social issues, however, can not be left out of the analysis. It is suggested by David Geary (2008) that humans are inherently motivated to engage in activities that enhance knowledge of the self, social relations and group dynamics. Geary argues that there is a motivational gap between 'folk knowledge' (basic concepts that need to be learned to function in a community under the present conditions) and secondary knowledge (mainly academics that are learned only through books and school). Academic knowledge, other than basic knowledge acquisition which children participate in quite readily, is considered to be secondary knowledge that is not a necessity to social survival. People are not intrinsically motivated to learn secondary knowledge. Geary (2008) continues to say that schools were put in place to close gaps between basic cultural (folk) knowledge and

secondary competencies, but notes that the process of transition is easier if children enter schools with some preparation for academic learning. For example, the transition from language acquisition to reading books (Geary, 2008). The ability to transition to secondary materials is already rehearsed in households where there are structured activities and parents take on a teacher's role in the home. These students have already learned the rules for being a student, and in turn have internalized the acquisition of secondary materials before they enter school. They can be motivated to learn the secondary materials, while other children may still be struggling to understand the purpose of secondary knowledge. Clearly, social influences have an effect on motivation, whether that be biological or because of reinforcement contingencies.

Van Berkel and Schmidt (2000) suggest using a Problem Based Learning model, which stresses the use of real life problems and applications in learning amongst college students, to increase levels of motivation and self application to the learning process. This means that learning must be relevant to the student's own life and cultural background. If this is true, perhaps first-generation students, who are able to apply academics as relevant to their own lives, have more motivation to go to college.

Three major categories of variables that affect motivation for learning have been supported by numerous authors. They are as follows: 1) input variables (student characteristics and background, teacher adequacy, student's learning behavior), 2) intervening processes (learning activities, time spent studying, instructional process), and 3) output variables (achievement, effective outcomes) (Van Berkel & Schmidt, 2000).

I believe that all of these factors play a large role in shaping students' motivation to attend college. Recently, I have also become aware of other cultural dynamics that may play a role. For example, in a cross-cultural class I was taught about a cultural reward band that lies in the

middle of a bell curve extending out one standard deviation on either side.

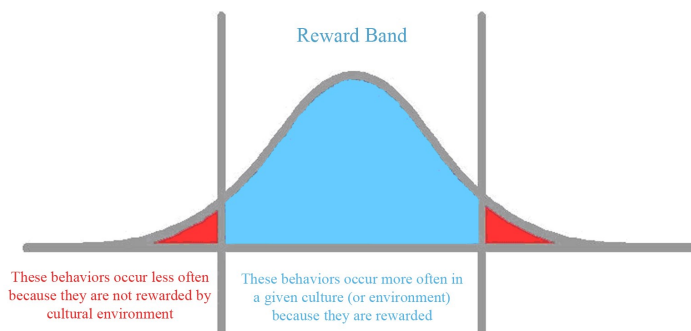
Behaviors and actions that lie within this cultural reward band are reinforced by the given culture, making people who do not act in accordance with the reward band behaviors less likely to encounter social reinforcements from their home community. This overlaps with the behavioral theory of reinforcement contingencies in which a specific behavior will increase in the future if it is rewarded (a reinforcement is only received if the specific response was made). It could be possible that certain sub-cultures in America value education and academic success more than others making it possible for a child to be in contact with more natural rewards for learning and therefore develop a more intrinsic motivation. Sub-cultures may be based on economic demographics, but can also stem from ethnic backgrounds.

Iyengar and Lepper (1999), show that culture affects motivation differently among Anglo-American and Japanese-American students, for example. While Anglo-American motivation was enhanced by autonomy, personal agency and freedom of choice, Japanese-American motivation was highest when decisions were made by trusted authority figures from their in-group. This is due to the cultural inculcation to promote harmony, instead of promoting individuality as is more prevalent with Anglo-American cultures. What is inculcated in American assumptions about motivation (i.e., the desire for self-control, a preference for choice and empowerment) will not necessarily have the same effect for students from different cultural backgrounds. This means the nature of the American school system may actually enhance intrinsic motivation for some while lowering it for others.

Methods

For the purpose of this study I used a phenomenological design which allowed the participants to describe their experiences of getting to college. Participants were all students at the University of the Pacific in various majors and from different backgrounds. The development of their motivation to get to college was captured by their accounts of everyday steps they took. The present study identifies the trends that allow the construction of concepts about motivation for first-generation students that may be valuable to pursue in future studies. The nature of the study allowed for some cross-cultural perspectives to be gathered.

I utilized purposive sampling to identify participants who find themselves in the unique position of a female



first-generation college student. I chose to limit the sample to females in order to not confuse gender differences and to keep the focus on the original question of first-generation motivation. The Community Involvement Program (CIP) was used as a starting point of recruiting members. CIP is an institutionalized program at the University of the Pacific to help first-generation students and other at-risk students.

I was able to meet with and interview ten female first-generation college students. They were categorized by however they chose to refer to themselves as. This led to a Race/ Ethnicity category. Please refer to the table at the end for a specific break down of the informants. Data were collected in the form of an interview with a pencil and paper approach. After all participants agreed, interviews were recorded in order to be reviewed when the information was analyzed. After initial interviews had been conducted, data were analyzed, reviewed, categorized and reorganized for theories and topics. In the present study, initial interviews were focused on life histories with some focused questions to address the topic of motivation in the participant's life history context as it unfolded during the interview. Themes and constructs aided in organizing the data. However, the interviews were not guided as I did not want to bias the answers by asking about specific themes. I wanted the participants to retain the freedom to speak about whatever they wished and not be guided by a structured interview.

Results

Of all the responses gathered from participants six major topics emerged. Each of these is, what I call, a supportive factor in promoting entrance into a University for first-generation female college students. They are the following, in the order that they were most mentioned: 1) parents, 2) school, 3) personal attributions, 4) goals beyond college, 5) peers/friends, and 7) other family members. Not each of the supportive factors was manifested in the same way for each participant. Therefore, there are sub-categories of general themes within each broad supportive factor. In addition, the categories I have developed are not mutually exclusive and often they blended into one another. I chose to make certain decisions on how to group factors that my informants mentioned.

This study also had some focus on cultural differences as well as the broad commonalities. With only ten participants, cultural factors were harder to tease out from the data, though a few, specifically for Asian-American cultures, African-American and Mexican-American could be found.

Topics Raised

Parents

For many of the participants it was very important that their parents talked about college. There were many stories of how parents frequently, even from a very young age, underscored the importance of academic achievement and going to college. A few participants mentioned never having been given another option. This means that from a young age, they were constantly reminded that they must push for college and academic achievement. For many this push became internalized and then utilized without parental reminders. Some parents took the route of accepting only A's: others supported their children by pushing them to 'do their best.' Both seemed to have a positive effect on the participants' motivation for getting to college. These parents displayed an understanding of the American culture and the value of education this society holds.

Many of the participants mentioned how important it was that their parents had "mellowed out" over the years and become more acclimated to the American system. This was partly due to time, and partly due to older siblings "messing up" first, thereby making the parents less strict on the younger daughter.

Along with understanding the educational system, it was often crucial that parents supported the children along the way to college. For two of the bilingual participants their parents' willingness to teach English to their children eased their transition into school and helped them integrate into the classroom. There was one very specific example where Alyssa's mother took on a teaching role, promoting and encouraging learning at home. In this way, learning at school was also fun for the participant and she was able to immerse herself into school work with enthusiasm. In addition, Alyssa was given homework and other academic help, allowing school and home to bridge, thus making other supportive factors less important for her success; "I actually didn't go to preschool. My mom taught us everything we needed to know... with homework, she was there... My mom did a lot of it [applications, navigation of the University system]." In fact, this participant only briefly mentioned other factors in her life.

Support did not necessarily have to be academic. Hailey described the support differently:

They [her parents] did tell me that they regret not going to college and not be able to give themselves time to, you know, experience that. And they told me that, my mom always said 'One time I had connections to this college that I really wanted to go to. My parents never pushed it. They

never pushed me, I never had that support. And same thing for my Dad, which is why he dropped out of college, you know. Howard University... really good school and he dropped because he didn't have the support from his family... He would have been a first-generation. My mom would have been a first generation, but they didn't have that support. And, um, it makes me sad to think about it, but you know what, it kind of works like trial and error, you know. Because they knew they didn't have that support, they wanted to be that support for us. So, you know, that helped me get to college... I know that had a big push on them, knowing they regretted it and didn't have that support, to be that support system for me.

In this case, support was given in the form of encouragement and belief in her ability to get to college. The parents wanted Hailey to be able to experience the things they had wished they could have experienced. Some participants felt a certain amount of pressure from their parents to be the one to make it. These parents depended on their children to do what they had not done. Although this was a heavy weight, it also instilled a sense of pride in them to make them want to do that for their parents.

Some of the parents wanted better for their children as described by Lea:

I would say my Parents [helped me get to college]. They want me to get a great education. They don't want me to work at the jobs they have now. My dad works at the cottage bakery in Lodi, and he works approximately 8-10 hours per day. That's a lot to me, and I don't... he doesn't really want me to work or have the same lifestyle that he has. My mom is a house keeper and she's always tired, and complaining about stuff. But she's happy. Well, I, She says she's happy... That's basically why I came to college, because of my parents.

School

All the participants mentioned some supportive factors in schools. These can be broken down into four main categories: teachers, career center/advisors, school programs and the overall school culture. Before delving into these, it is worth noting that all the participants mentioned the need of financial aid from colleges they applied to. Had they not received financial aid, they would not have been able to go to college. They were glad that the University of the Pacific offered them such scholarships allowing them to pursue a college education.

Teachers

Teachers were very important in the lives of the participants. Many high school teachers were successful in integrating the idea of college into the everyday curriculum. One participant described how the teacher would just ask in class who was applying where and if anyone had gotten accepted yet. They would offer emotional

support as well as academic support that also involved college searches and helping write personal statements. Some in particular went beyond what would be expected of a teacher, which had considerable influences on participants. As Rachel described;

Something that really helped me get to college is my teacher. My English teacher Mrs. Haines. She says she's about 70 years old, but I do not believe it at all. She has such high energy. She has such high standards. I was in her bible lit course and it was such a heavy class... but was fun. Everyday there was a fun activity that made it stick... And she's a really fun and open and honest person. And she'll tell you what you need to know. She'll tell you about scholarships, she'll tell you about events you need to go to... I just learned more about scholarships; she helped me with my personal statement. She helped me with looking at more colleges. She got me to look at a broader spectrum of... schools... I still talk to her 'till today. She sends me these weird, funny joke text messages... After the volleyball practice, we'd [her and her friend] go to her classroom. A couple of times she'd take us home if she thought it was to late to walk home or get on the bus.

This kind of support from a teacher gave Rachel access to looking at colleges and being able to navigate the educational system. The teacher really cared for the students, stayed late at school to give them a classroom to go back to, and took care of them beyond academia, which allowed a close relationship to form. This way, the participant was able to get the necessary support for getting into college.

Career Center/Advisers

Many of the participants felt lucky for the support they were able to get from their career centers. For many of them the guidance counselors made an effort to seek out the students by coming into classes, making announcements and personal phone calls. In that way the resources available in the career center were brought to the students. The few participants that did not have such outreach career centers also mentioned not using it as a resource and had little motivation to check it out. Gabrielle gave an account that covered everything the guidance counselors were capable of doing:

I went to my guidance counselor and she, just, kinda helped me help figure things out. I think, this might be very sad to say, but I think if I was left to my own devices I probably wouldn't know what to do and I probably wouldn't be here. It would be very different, how I got to college... There were eight guidance counselors... they start calling you down for college meetings and if you need the help... they help you, but you have to let them know, keeping them updated with the process even if you didn't want the help. My guidance counselor really helped me a lot, 'cuz I didn't know what to do... I mean, she did everything from calling the school even. She called pacific for me. She even wrote me a recommenda-

tion...She was side-by-side. I didn't have to pay extra, I mean she was my guidance counselor.

Destiny expanded on this and described the career center as a cool place to hang out for the students. The staff was friendly and was addressed with 'Auntie.' A strong familiarity allowed Destiny to feel at home and comfortable in the office context. It was an atmosphere of acceptance and the students were happy to be there. In that way the career center was able to attract students and put them in touch with college materials without having to force it upon them.

School Programs

A few of the participants mentioned school programs that were created for at-risk students that helped them achieve their goals. For Rachel this was an after school program titled Fresno Best, which gave her a place to focus as her home was not ideal for studying or relaxing. Here she had computer access and was able to make many new connections that helped her meet influential people and find a tutoring job. There was also an actual classroom program that Lea was automatically enrolled in. During this class they would receive college information, help with essay writing and would go on tours of colleges in the area. It helped her with the navigation of the college world and gave her the support her parents could not provide as they did not fully understand the system themselves.

School Culture

A few of the participants found themselves in a school culture where college was actively promoted and most of the graduating students ended up going to college. As Gabrielle described: "Half the reason I even applied was, because all my friends were talking about applying... And then, my guidance counselor being on my ass ... it was like, always in my ear, always in my head. It was always talked about. Definitely a big push." This supports what Pascarella et al. (2004) said about not having access to the information concerning college. Gabrielle was able to overcome this disadvantage, because her school environment actively provided the necessary information for her. Destiny also found herself in a similar situation where she was able to attend one of the top private schools in Hawaii and found herself immersed in a culture where everyone was expected to attend college. In this way everyone was promoting college everyday and it became routine to talk and think about it.

An interesting account was that of the "school split." In this case Rachel said that her school was comprised

half by children from the neighborhood and half students being bused in, who tended to be the 'smarter' kids. She was able to befriend the bused-in kids by working on their level and was thereby brought into a peer culture where college was important. A similar situation was that of Hailey, who took part in advanced classes and had more contact to a college-oriented environment. This type of school environment was very important to Rachel and Hailey. They made very clear that applying to college and the idea of college was regularly discussed in these social settings and that it helped them immensely with the motivation and logistics of getting to college. Even though the whole school was not culturally inclined towards college, they were able to get into the settings where it was "cool" to excel in academics. However, this was not available to the larger part of the student body. These participants were able to get this supportive environment only under special circumstances, unlike the aforementioned situation.

Personal Attributions

Love of learning

The biggest personal attribution that played a major role for some of the participants was the internalization of a love for learning. As Marcoulides et al. (2008) points out, having high academic motivation plays a major factor in supporting a student's schooling. Those who have little academic motivation have an increased risk of dropping out. On the contrary, by possessing this kind of motivation, participants felt school was a natural activity they wanted to partake in, including higher education, and for some, even beyond a bachelors degree. When asked what made her go to college Alyssa responded:

Mmm. I don't know. I... I guess the fact that I've always loved school was definitely, like, I have to go to college, because school is awesome."

Julia also mentioned a love of learning.

I love, I love going to school... I guess, in school I was able to experience a whole lot of things. I learn a whole bunch of things and, um... Being at home just seems so one dimensional. I didn't really have a lot to talk about with people at home. There's stuff like 'oh yeah I'm gonna eat this tonight... What do you want to eat tonight?' There's not a lot of, like, stimulating conversation going on.

An important note to what both of these participants mentioned later on was that school was not only interesting, but also a safe place for exploration. They did not have to worry, and were able to fully indulge in the learning process. Many of the other participants agreed with the idea of loving to learn. It gave them more reasons to be at school than their parents had. It allowed them to

discover their passions and find out more about themselves. In this way they felt they had a genuine interest and ownership in what they were studying.

Independence

College was also seen as a means of declaring the independent self. For some of the participants, going to college was a way to separate from the family and explore being independent, which is highly valued in American culture. Hailey recounted:

One week, I tried to separate myself, you know what I need to be an individual. I'm going to try and take a whole week and not talk to me mom. If I didn't call her, she would text me. If I didn't text her, she'd facebook me. If I didn't facebook her, she'd aim me. It was just like, you know... I want to try to experience this all by myself. Now, it's just me. And I like it. It feels like I have my own life. It feels like I am my own individual... When people think of me... they think Hailey the communications major, you know, this individual.

Although for none of them it was about losing or denying their family, they needed to be able to assert themselves without the family factors constantly being present in their lives. Most of the participants mentioned, in some form or another, the close familial ties that they were breaking out of as an individual or a first-generation college student. Having this sense of individualism enabled them to have the personal power to push for separation. As Julia phrased it, being dependent on herself made her want to push through and figure out how to navigate the system on her own. It creates a sense of determination that more than one participant mentioned during the interviews.

I guess... personality trait that kind of developed was definitely...the fact that we weren't well off. I never expected anything to come very easily. I knew if I wanted something I'd either have to work for it or wait for a very long time...Since my school life and family life was so separate, I felt that if I wanted anything in school, I had to make it happen, 'cuz it seemed like that was the only way anything would happen.

Pride

Being proud of oneself also played a role in their motivation to get to college. It made many of the participants feel great pride that they would be the first to make it to college, even in comparison to older siblings. Many of them had older siblings who did not make it to the four-year university nor any that had graduated or are as on track as they are. Some also felt proud of being able to show the way for other students. Rachel said: "They [students she volunteered for] saw me go through like high school, and I want them to see someone able to go through college, because I didn't get to see that." Others did this kind of 'prideful role-modeling' for their

younger siblings. It was important that they were able to show others that college is possible and be the person that has the potential to help others make it, too.

Destiny also continually mentioned pride as a huge factor in her ability to be different. She had too much pride to make the same mistakes her cousins had made; she had too much pride to upset her family by not succeeding. Pride that got her through the difficulties of the first two years of college. She wanted the ability to prove her cousins wrong and make her *popo* (grandmother) proud as she had already seen so many of her family members "mess up." Staying or returning home would have been the easy way out for Destiny.

Goals

This section refers to the long term goals the participants had when considering college. It addresses what ends college was the means for. Specific careers were rarely mentioned. As Richard Malott (2008) points out, school or college becomes a means of getting to another reinforcer. Participants did, indeed, frequently mention their aspirations, or often choice reinforcers, that they associated with getting a college degree. It is also a sign that participants were able to internalize the motivation for going to college, because they could relate school to their own lives in a way that made it meaningful and useful to them. This is what Van Berkel and Schmidt (2000) meant by their Problem Based Learning model: That learning is most effective when it is applicable to oneself.

Wanting it Better

Many times this desire was supported and underscored by the parents who pressed for a better life for their children. The desires of the parents became intrinsic to many of the participants. Many wanted to be able to avoid the struggles and hardships they had experienced. This was consistent among all participants. Of course, the concept of wanting it better was closely tied to getting a good, supporting job and being able to have enough money to live comfortably. Most of the other goals are innate to wanting it better. Indeed, many of the participants broadly stated just "I want to have it better," and it therefore deserves a category of its own.

Stability

This was a very interesting aspect that was part of the "Wanting it Better." Many participants had gone through some major volatile life events. This included money, housing and family problems that fluctuated over the years, giving many participants a feeling of uncertainty,

unpredictability and helplessness. Stability was the term used to describe the desire to avoid such uncontrollable phenomenon in their lives. Being able to keep a stable home was also very important to this concept. Many participants hoped that they would be able to provide this sense of stability not only to their future children, but also to their parents and siblings. Rachel recounted:

I know what I wanted most in life was stability... I just hated moving, and I knew if I could get to college, I could get a good job, I could be stable. I'd be able to sit somewhere and stay somewhere. My kids would be able to sit somewhere and stay somewhere... and be in a good environment. Be in a good household.

Amy also spoke along the same lines:

I just don't want, I don't want to have to worry about... you know... wondering whether or not I'm going to be in my house the next day. Or whether or not I'm going to have a home the next day. I don't want to have to worry about, just, struggling and getting stuck at a job I just hate. I don't want to have to struggle like that... I just don't want to have to worry and struggle.

Support Self and Family

Many of the participants mentioned the desire to be fully independent and having the ability to support themselves and others. For some it was sufficient to have enough money in order to live a decently comfortable life, by their standards. Others indicated the desire to not only be able to provide for their own, and family's needs, but also to provide the wants. This did vary from participant to participant, often dependent upon the parents' expectations of the child as well as the participants own desires. Amy described an incident revolving around her birthday:

I always got what I needed, I may not have gotten it... I needed it right at the moment, but I always got it in a good time span. I didn't always get what I wanted. A lot of people didn't get what they wanted. But I remember one time...like, 'cuz going to a private school we had to pay for that. It was my birthday and we had to pay for tuition... and I remember I didn't get a birthday present from them ... and I remember getting some snacks from, like, Wallgreens. Like just a whole bunch of snacks. It was just like what...? We don't have money to be spending on a birthday gift.

Hailey mentioned the need to help her family:

I've always wanted to help my family. I just want to be able to, you know, have to worry and struggle. Even now, if my parents were to come and say... 'we are struggling, we're gonna lose the house.' I would, without a second thought, would say 'Please take whatever money is in my savings account and use it.' I want to be able to help them, you know, without a second thought. I don't want to have to worry about 'Oh, well what about this or that.' If they ever needed anything I would want to be able to fulfill that need for them. Not even just needs, but wants. If there was anything my mom wants or my dad, or anything my brothers want, I want to be able to give it to them just like that.

Jenna mentioned the need for supporting herself, although she placed little emphasis on her parents.

It all depends on if I find it interesting, and whether I'd be able to make a living out of that career. That's one thing I always keep in mind. You need to have reality checks sometimes... I don't really mind whether or not I have a lot or a little, as long as I earn enough to make a living for myself... because I'd really love to be independent, at least financially.

Learning/Experiences

Some of the participants made clear that they had a joy in learning and that college represented a way of gaining important knowledge as well as life experiences. Julia described:

I guess to me, college was an end. So now I'm enjoying the journey to where this new end, where I have no idea where it's gonna be yet. So right now I'm focusing on the journey.

Gabrielle mentioned that she had been planning on college simply for the sake of getting a better job. However, upon experiencing college she now finds herself focused on specific goals and enjoying the environment she has become a part of. It allows her to think on a higher level, and she described it as having "woken up from a dream." Gabrielle described the environment at the University of the Pacific as refreshing both mentally and physically. She was given the space she needed to explore and grow and that was extremely important to her. This had not been possible while living with her parents.

Destiny also spoke about how college meant gaining experience away from home, giving her the opportunity to break away from following in her cousins' footsteps and to make new friends. Although family was extremely important, embodied by the Hawaiian term "Ohana," which extends the term family to everyone in the community, getting away from that community opened a world of new experiences that she would not have been able to get otherwise. Getting away from the island was an important factor in accomplishing this.

Peers/Friends

One of the greatest influences peer groups could have was when they were also focused on going to college. This is connected to Geary's (2008) discussion about motivation being linked to social, specifically group dynamics. If this is true, then peer groups can have a high level of influence. This often correlated with the aforementioned college-oriented school culture. Students who were a part of this culture were more likely to be college-oriented within their peer groups as well. Rachel gave a clear description of her peer group:

"So my group of friends consisted of kids from the Com-putech program that wanted to go somewhere and from

neighborhood kids who wanted to go somewhere... It was really interesting. I don't know what I'd do if I lost contact to them, even now.

Hailey mentioned the peers she had in her advanced placement courses:

I would be in some AP classes... or I would take honors, you know, advanced sciences. So those were my classmates. The people who had that kind of support. So, when they were talking about colleges, I had no idea what they were talking about. They had older siblings that know the ropes. So, they had and had it pretty much clear cut for what they were supposed to do. So I would ask them questions, just some questions like 'Hey have you taken the SAT II? Or do you know when it is,' and they would be like 'Oh yeah....'

In that way they were able to support each other when there were questions, especially when the parents did not know the answers or were uninvolved in the process. It allowed many of the participants to find support for navigating the system simply by having the subject of college, and things such as the SAT and deadlines, often discussed. In that way they could casually ask questions without feeling embarrassed.

In some cases a mother of one of her friends became what I would like to term the "school-mom." They helped in ways that their parents did not, such as looking at college information and going to visit campuses. The "school-mom," also supported the participants' parents by giving them information on what things they could be helping with.

Peers and friends, then, were a main form of support for college. Those participants who did not have friends as interested in college, found the necessary support in themselves or from other external factors such as their parents or school.

Other family members

Many participants had strong support from their grandmother, who provided overall support for whatever the children chose to do, but also pushed them to succeed. Just by saying they were proud of them, helped motivate them. One participant said she was motivated because her grandmother was proud of the generational shift that had taken place, and they were happy to see someone in their family go to college. Destiny described a very close relationship to her grandmother:

My popo [grandmother], because she saw my other cousins, and how they didn't go to college and didn't graduated... by the time I was applying to college they should have graduated college, but they didn't 'cuz they stayed home, went to community college... my cousin... who is like my popo's pride and joy went to UH and then dropped out, and he still hasn't graduated. So by the time I was ready to go to college she [popo] was really pushing for it... My popo is like older, and I know she wants to see me graduate... so I have way, way, way too much

pride in this to back out... At home you talk to your grandparents and you really respect them and care about what they think. I feel like, a lot of people, if they were in my situation and they, like, didn't have that grandmother there, then they could get messed up.

In addition, having younger siblings forced many of the participants into the responsible role of a caretaker. In this role they had to learn patience, independence and responsibility which participants said enabled them to come to terms with their own lives. Julia said she had to "ensure that he's [her younger brother] healthy academically." In order to do that for him, she had to stay on track herself. The participants admitted that at times it was a burden and difficult to take on the care for the younger siblings, but they all have made it a part of who they are to their own advantage. Amy described her relation to her siblings from a very mother-like perspective:

Oh lord... being the oldest is a lot of responsibility. You have to set the example. You have to play the second mom in a lot of examples... Especially growing up in Oakland which is a city with, you know, a lot of violence. I do help them with school. I continue to help them with school when I go back sometimes... When they had questions they would come to me.

Julia expanded on her idea of keeping her younger brother "academically healthy,"

I've been taking care of him since he was young, and, because I guess I knew what was going on, I took a lot of responsibility for taking care of him... I think I had a lot of responsibilities and I knew I had the responsibilities. I was aware of them... I guess if you have a sense of you should be doing something, it just kind of stays with you forever.

Hailey also described having to take on a mother role:

It kind of becomes a chore to have so many siblings... I get very motherly at times... It's helped me become a leader... It's helped me become more understanding.

Cultural Differences

Since there were only ten participants, information on cultural differences was limited. However, a few items are worth mentioning.

Asian-American Trends

These participants tended to lean more towards an independent, intrinsic method of motivation for getting into college. They were shaped by their parents, and although they had big dreams for their daughters, they tended to only be involved in school as far as requiring top grades. Navigating school and wanting to do well became an intrinsic desire of the Asian first-generation participants. They were also more inclined to state the importance of enjoying learning and exploring while in college. Most interestingly, all three of the Asian partici-

pants chose their own major, none of which fit into, what they all labeled, the "typical Asian" customs. Julia used the term 'Asian-mom disease,' which refers to the pressure to do well and to be a pharmacist or biologist placed on Asian students by their mothers. This seemed connected to the fact that home and school were clearly divided, often due to language barriers. For each of the three Asian participants, it was a source of establishing their independence and taking control of their own lives when they decided to go into a field they were passionate about. It also supported their love for learning. Samantha retained her full autonomy for two full years before she told her parents that she was in International Studies instead of what her parents preferred. She had not wanted to take the risk of having her life direction dictated for her. It had been a difficult moment to tell her parents, but Samantha stated that things have worked themselves out.

African American Trends

The greatest trend seen for the three African American informants was the centrality of the family, especially when it came to talking about the goals. Although they wanted money, it was more a means to be able to take care of their parents as well as themselves. Not only did some of the parents expect the support, but the participants felt it natural to give it to them. When they spoke about the benefits of college and their motivation, they often emphasized how it would help their whole family and that that was extremely important to them. This need to help the family may have given them the motivation they needed to push for a college education.

Mexican-American Trends

The two Mexican participants, Alyssa and Lea, were most likely to talk about their parents' home support for schooling. Both had mothers who were able to help them either by filling out forms, providing homework support or by driving them to activities and competitions. Their parents were also more likely to let them only have the role of student, instead of expecting them to also work at home or care for siblings (at least they did not mention it). They were then allowed to focus on school work with a higher level of concentration than other participants, or so they felt. In addition, they were given less rigorous standards for success. Doing their best was good enough for their parents, unless they dropped below C (in some cases B) grades. This is a reflection of the deterministic and somewhat fatalistic outlook on life common to Mexican culture (Storti, 1999). As far as children are concerned, although they need some guidance and protection, they

do not need extra motivation or pushing from the parents in order to develop, they develop into who they were meant to become regardless of such efforts. Parents pushed for improvement, but expected no more than the participants to try their best and succeed well by their own standards. This may have given them the support they needed to gain a competitive edge in the academic setting, because they may have viewed school as less stressful and overpowering. The school, and specifically grades, did not overwhelm their lives.

Discussion/Conclusions

Based on the data, it is important to note that one participant had all of these possible support factors in their lives. In fact, some of the support factor categories turned into risk factors instead. When that happened, the participants focused more heavily on one or more of the other support factors in order to overcome the risk factor. That is to say that when one part of their lives was not supportive, another was more prominent to "pull up the slack." In one instance one participant's parents did not fully comprehend the importance of college in the U.S. and did not actively participate in the schooling process. Instead, she was able to find parental support through friends' parents and advisers which canceled out the lack of support from home. Another participant was faced with an unsupportive and anti-college-oriented peer group. When asked why she did not go along with them, she simply stated her Dad did not make that course of action (drugs, alcohol, partying...) an option. Pressures from home and parental involvement prevented the negative impact from peers to become seriously influential. This makes sense, but the interesting part was that it was usually one or two main factors that were seen as very important by the participants, instead of an even distribution between all of the factors mentioned above.

Many of the analyzed sub-sections of support factors in motivation to get to college transcended cultural borders. Similar words and phrases were used by all of the participants, although upon further inquiry some differences could be found. What is important though is that many of the participants placed importance on the same type of assistance, even if it varied slightly in form from individual to individual.

Interesting as well is that most of the factors were extrinsic to the participants. This suggests the need for factors outside of the individual's locus of control to be supportive in their process of getting to college. There were personal attributions that were mentioned, but they were rarely focused on nor expanded upon even with ex-

tra questioning. As mentioned above, intrinsic motivation was more common amongst the Asian Americans who expressed some language barriers between school and home that forced them to take control outside of the home.

The large role school, its advisers, teachers and culture played in the lives of most of the participants also suggests the need for better school policies in support of at-risk populations. Most of the participants who had excellent resources at their schools also mentioned that they felt privileged and lucky to have had that support, implying that other schools do not offer such benefits for the students. This could be done with further research to identify the most important things which schools should offer. It is clear that the openness and the active reaching out to students was a deciding factor of the program's effectiveness. The few participants who did not enjoy the support factor of a good career center and culture, also criticized that available resources were not advertised and not well known by the student body.

There were limitations of this study that could, and should, be expanded upon in the future. Primarily, participants were found only from one school due to time and resource constraints. Interviews should be conducted at numerous campuses to broaden the scope of the study. This would also open the door to a more specific cultural analysis which is important for an ever increasingly diverse student population. All ten participants were supported in different ways, and perhaps finding cultural trends would help create schools and intervention programs applicable to more students. In addition, a bigger sample size could be used to yield statistical analysis which will make it more viable to other disciplines as well as policy implementations. Finally, the study should be expanded to include male as well as female participants.

Despite these limitations, the study yielded interesting and usable information. It is a good reference and jumping point for further research. The six identified factors could be used for more focused interviews. This research used open ended interviews where the direction of discussion and questions were guided by the participants. This does leave room for subjectivity, but also prevented the interviewer from missing crucial information by using biased or loaded questions. Now, however, the information could be used to formulate structured interviews to obtain more objective results.

List of Participants – No real names are used in this paper so participants remain anonymous.

References

- Geary, C. D.
2008 An evolutionarily informed education science. *Educational Psychologist*, 43(4), 179-195.
- Iyengar, S. S., & Lepper, R. M.
1999 Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology*, 76, 349-366.
- Malott, W. R.
2008 *Principles of Behavior: Sixth Edition*. New Jersey: Pearson Prentice Hall.
- Marcoulides, A. F., Gottfried, E. A., Gottfried, W. A., Oliver, H. P.
2008 A latent transition analysis of academic intrinsic motivation from childhood through adolescence. *Educational Research and Evaluation*, 13, 411-427.
- Pascarella, T. E., Pierson T. C., Wolniak C. G., & Terenzini T. P.
2004 First-generation college students: Additional evidence on college experiences and outcomes. *The Journal of Higher Education*, 75, 249-284.
- Storti, C.
1999 *Figuring foreigners out: A practical guide*. Boston: Intercultural Press.
- Van Berkel, M. J. H., & Schmidt, G. H.
2000 Motivation to commit oneself as a determinant of achievement in problem-based learning. *Higher Education*, 40, 231-242.

HAITIAN DISASTER VULNERABILITY AS A COUPLED SOCIAL-ECOLOGICAL SYSTEM

JOHN MCGREEVY

ABSTRACT

Throughout its history, Haiti, often labeled the poorest country in the Western Hemisphere, has experienced a multitude of disasters. In 2010, a magnitude 7.0 earthquake killed 300,000 people in and around the capital city of Port-au-Prince. Compared to similar magnitude earthquakes, the 2010 Earthquake caused far more damage, suggesting high disaster vulnerability in Haiti. Personal experiences in Haiti during the earthquake, along with field research during the summer of 2012 and winter of 2013 suggest that viewing Haiti as a Coupled Social-Ecological System will help in understanding why this earthquake was so devastating. To elucidate factors influencing vulnerability to disasters in Haiti, I examine the complex, nonlinear interactions between environmental, cultural, and historical aspects of life. Specifically, I identify three types of failures that led to vulnerability in Haiti: Infrastructural Failures, Institutional Failures, and Resource Failures. Rather than focusing on environmental or social factors alone, I target the interaction between these factors and present the 2010 Earthquake as a product of interconnecting social and ecological processes.

Introduction

In September of 2004, Hurricane Jeanne pummeled Northwest Haiti, killing 3000 people in one night in the city of Gonaives (Latortue and Vazquez 2006). Six years later, in 2010, a magnitude 7.0 earthquake decimated the nation's capitol city of Port-au-Prince, killing over 300,000 people (Farmer 2011). These disasters appear like random happenings that fell upon an already burdened country that is generally acknowledged as the poorest of the Western Hemisphere. Yet, looking at similar events across countries demonstrates the heightened vulnerability of Haiti to disasters (Etienne 2012). For example: an average of 15 earthquakes of a 7.0 magnitude or higher occur each year, but the 2010 Haiti Earthquake remains the deadliest earthquake since 1556 (USGS 2010). Likewise, Hurricane Jeanne passed directly over Cuba and the Dominican Republic, but no lives were lost in Cuba, and only 18 were lost in the Dominican Republic, Haiti's only neighboring country (Bermejo 2006). Ethnographic literature on these topics suggests that Haitian disaster vulnerability does not come from linear processes or isolated cause-effect relationships. Instead, complex factors from social and environmental systems, including environmental degradation, urbanization, and outsider politics, combine to impact this vulnerability.

To better understand these complex interactions, I use recent ethnographic literature and my own qualitative field research to analyze vulnerability to the 2010 Haitian Earthquake. Rather than focusing on environmental or social factors alone, I target the interaction

between these factors, viewing Haiti as a Coupled Social-Ecological System (Liu et al. 2007).

Contributing literature on the 2010 Earthquake includes ethnographic work from anthropologists with decades of experience in Haiti (Farmer 2011; Schuller 2010) and autoethnographies written by Haitians (Schuller and Morales 2012). To imbed this work further in the local-historical context and to draw connections between natural and social life, I use ethnographic works written before the earthquake (Smith 2001; Smith 2004; Kovats-Bernat 2006). To add depth and local insight to gaps in this area of research, I also include personal experiences and conversations during and after the 2010 Earthquake. I support this with qualitative field research I performed in Northwest Haiti during the summer of 2012.

I use combined analysis of these sources and the Coupled Social-Ecological Systems framework with the purpose of revealing factors that influence Haitian vulnerability to disasters. This may be useful in improving Haitian disaster preparedness, relief, and recovery. Through this research process, I identify Infrastructural, Institutional, and Resource Failures that impacted Haiti's vulnerability to the 2010 Earthquake through social-ecological processes.

Coupled Social- Ecological Systems

To better understand the multifaceted complexity in many human-environmental systems, particularly feedback and dynamics, the last decades have witnessed the advent and increasing popularity of a new paradigm: the coupled natural and human systems approach. (An and Lopez-Carr 2012:1)

Western society has long compartmentalized nature and humanity as separate entities. Knowledge, land use practices, food systems, and daily activities seem to perpetuate this social-ecological disconnect. Social scientists argue that Western production and transfer of knowledge are tied into different "silos" of knowledge, with little collaboration between different fields. Ingold (2000:1) describes this process as follows:

These fractures ultimately seem to derive from a single, underlying fault upon which the entire edifice of Western thought and science has been built - namely that which separates the 'two worlds' of humanity and nature.

Although there is a growing move to work in interdisciplinary ways, the structure of academic disciplines creates and promotes knowledge in the social sciences as separate from those in natural sciences. Spense (1999) similarly discusses how Western nations tend to separate nature out of society into parks in ways traditional societies do not. These parks are reserved as space supposedly untouched by humans, where people can encounter nature detached from their daily lives. Similarly, Western food systems tend to instill cognitive distance between humans and the food that they eat, stripping it from its natural context and creating more boundaries. Eriksen (2008) describes this process as intensification, specialization, distancing, concentration, homogenization, and the masking of feedbacks. Yet, this perception of separation is not universal across cultures, and other peoples show sensitivity to feedbacks from the environment.

Despite its close proximity to the United States, Haitian society seems to live as though there is no separation between humans and nature, even if some locals have taken on Western educations and values. Throughout my interviews, one of the most common phrases I encountered when talking with Haitians about trees was "*pyebwa yo se lavi!*" meaning "trees are life!" Such a phrase was usually accompanied by energetic hand gestures (a common aspect of Haitian conversation that coats words in emotion). While this may simply be a local idiom tossed about whenever the topic arises, the inseparability between trees and life, between ecological and social, radiates throughout Haitian life.

Thus, when non-Haitian scholars ask research questions, make observations, and draw conclusions, they often to do so through the lens of Western compartmentalization of humans and nature. Doing so ignores the complex web of social and ecological factors that interact and impact Haitian vulnerability. Because of this, literature about Haiti over the past decade has increasingly pro-

moted the necessity of understanding local views and nuanced aspects of local culture in order to more fully comprehend processes in Haiti. This includes work with environmental issues (Murray and Bannister 2004; Sprenkle 2008), health issues (Farmer 1992), and family planning (Maternowska 2006). Anthropological literature on a broader scale has also come to acknowledge local knowledge as valuable and complementary to Western science because of its ability to provide social-ecological data not otherwise accessible (Berkes 2008; An and Lopez-Carr 2012; Thornton et al. 2011; Marin 2010; Sillitoe 1998; Ingold 2000). With insight into the interrelationship of social and ecological processes, local knowledge seems imperative to understanding Haitian disaster vulnerability.

Due to heavy reliance on the environment and Haitian sensitivity to interconnected social and ecological processes, the Coupled Social-Ecological Systems approach can help outsiders understand local knowledge and disaster vulnerability in Haiti. Based on literature on the subject, I define a Coupled Social-Ecological System as a non-linear network of interconnected social and ecological factors in which "people and nature interact reciprocally and form complex feedback loops" (Lui et al. 2007:1513). I attempt to illuminate these interconnecting processes through the use of the Coupled Social-Ecological Systems approach and qualitative, ethnographic research that promotes local knowledge.

Qualitative Methods

As discussed by Marshall (1996), methodology should not arise from the preferences of the researcher or what Western culture deems valuable but from the focus of a project. Quantitative methods have their uses in Haiti, such as tracing epidemics or the flow of aid. Yet, when looking at wider connections of the Earthquake to social and ecological processes, it is important to understand how quantitative methods assume that researchers know ahead of time both the key problems and all of the answer categories that could occur (Rubin and Rubin 2012). In order to reveal these categories and better understand the nuance of Haitian life in relation to disaster vulnerability, I examine qualitative literature in relation to my own qualitative field methods of in-depth interviewing and participant observation.

Interviews and Observations

As one of a relatively limited number of outsiders present in the country during the 2010 Earthquake, I include in this paper my informal observations from 2010 and results from qualitative field research conducted in

the summer of 2012. Over the course of eight weeks, I performed 30 in-depth interviews, 28 hours of participatory observation, and 30 informal interviews while walking around *jaden lakou* (family gardens/farms). This occurred across four different areas of Haiti surrounding the cities of Anse Rouge, Ti Bwa, Saint Marc, and Port-au-Prince (see Figure 1). Most of the interviews and observations (about one-half) occurred in Anse Rouge. The rest were spread relatively evenly across the other areas.



Figure 1. Qualitative Research Sites- Summer 2012

Interview audio and in-depth field notes from observations in these diverse regions were then transcribed into text. To thematically code this raw qualitative data, I used Atlas.ti software and a mixture of line-by-line, incident-to-incident, and *in vivo* coding (Charmaz 2006). For *in vivo* coding, I looked for general terms, innovative terms, and insider short hand terms used by participants in their native language, Haitian Creole (Charmaz 2006). These terms help me to realize emergent themes with which to draw connection between social and ecological processes while preserving the local meanings and permeable flow between humans and nature in Haiti. These data were then carried through a three-step process of connecting the vulnerabilities to the 2010 Earthquake.

Haitian Disaster Vulnerability: 2010 Earthquake

As mentioned above, the purpose of this research endeavor is to use the Coupled Social-Ecological Systems framework to understand Haitian vulnerability to the 2010 Earthquake and the "Second Earthquake" of recovery. To do so, I use a three-step analysis: 1) Identify the direct causes of the initial catastrophe, 2) link these different

causes to the various social and ecological processes that influence Haitian disaster vulnerability, and 3) model the interactions between these influencing factors.

Step 1: Identify Direct Causes of Initial Catastrophe

On January 12, 2010, I found myself in Layaye, Haiti, an agricultural village in Haiti's *Plateau Centrale*. After the earthquake (which shook the village but left it unharmed), I travelled with a few local peoples to Port-au-Prince, where I stayed for eight days. There, I saw first-hand the direct causes of this catastrophe, the expedient and intelligent response of locals, and the absence of necessary knowledge in local processes for myself and most other outsiders to contribute effectively. While the oft-overlooked role of locals in their own disaster response as a community of survivors particularly struck me (as seen in numerous disasters (Solnit 2009)), I limit the focus of this study to the processes that led to vulnerability. I break these processes down into three sets of Failures, which I argue are intrinsically connected: Infrastructure Failures, Institutional Failures, and Resource Failures.

Infrastructural Failures:

At the most basic and immediate level, infrastructural failure was the direct cause of the destruction that resulted from the 2010 Earthquake and its aftershocks. Homes collapsed across the city, instantly killing tens to hundreds of thousands (Schuller and Morales 2012). Likewise, roads, public transportation, and governmental buildings



Picture 1. Buildings collapse on a bus in Port-au-Prince, destroying homes and infrastructure.

were destroyed or badly damaged. This includes the Presidential Palace, built during the United States Occupation of Haiti from 1915 to 1934. Also destroyed were 49 university buildings, 23% of the nation's schools (3,978), and 30 of the 49 hospitals or health centers in Port-au-Prince (Etienne 2012). Locals discussed with me the reoccurring fear of continued infrastructure failure in the days that followed. I experienced a glimpse of this fear as I awoke rolling back and forth on the ground as a 6.2 aftershock rocked me awake (along with the groups of Haitian families sleeping near me on what once was a soccer field). Infrastructural failure continued in the following weeks, and its impacts further led to increased Resource and institutional failures.

Institutional Failures:

At the next level, the immediate response to this disaster seems to be a failure at the institutional level. Lack of planning and slow response by the national government, the hundreds of non-governmental organizations (NGOs) in the country, the United Nations, and foreign governments led to increased suffering and thousands more deaths in the weeks to come (see Miles 2012). This type of failure has become known as recreancy in the field of disaster studies. Recreancy is the failure of institutions to carry out responsibilities they are trusted with, and it occurs in developing and developed nations alike (Gill et al. 2012).

Resource Failures:

In one of the areas that links more visibly to ecological processes, resource failures caused human suffering and death in the aftermath of the earthquake. Under this I include lack of food, lack of water, lack of gasoline, and lack of medical resources. This can also be seen as a lack of access to these resources, as imposed by institutional and infrastructural failures. I argue that these failures led to increased Haitian vulnerability to the effects of the earthquake through a network of interconnected social and ecological processes. I further argue that this vulnerability is increased and perpetuated through feedback loops of such processes.

Step 2: Link to Different Processes Influencing Vulnerability

In this study, I present different vulnerabilities resulting from each failure mentioned above. I further break these down into causes and results of the vulnerability from an ecological and social standpoint. In this way, I draw connections between the vast network of influences

impacting Haitian disaster vulnerability. I do not seek to provide an exhaustive list but rather to critically address two common Western notions: 1) that ecological and social factors exist independently, and 2) that Haiti's vulnerability to the 2010 Earthquake has resulted in a self-damning cycle of poverty and corruption without significant outsider impact.

Infrastructure Failure- Poverty, Inequality, and Poor Building Materials

Factors influencing vulnerability through infrastructure failure include poverty, inequality, and vulnerable building. As Schuller notes, the world readily acknowledges the poverty of Haiti, making it the only country with a last name: "The Poorest Country in the Western Hemisphere" (Schuller 2012). Furthermore, their inequality is among the highest in the world (Farmer 2003). What is not popularly acknowledged is the extent to which outsiders have impacted this vulnerability.

Different scholars in Haitian studies have written extensively about outside impacts on Haitian poverty and inequality, including Farmer's in-depth discussion of outsider impact on Haiti since the beginnings of the country in 1804 (see Farmer 2003). Most notable of these impacts are the U.S. Occupation of Haiti and the formation of the Haitian Army through a United States Act of Congress. After leaving Haiti, the U.S. appointed the mulatto minority to rule over the black majority, resulting in increased inequality and racism (Trouillot 1990). The formation of the Haitian Army led to military backed dictatorships that murdered thousands of impoverished protestors and stifled democracy in the country (Farmer 2003). One interviewee discussed the role of the Haitian Army in keeping things "business as usual" as follows:

I remember that day, that was November 29, 1987. So that was going to be the first real election. And the guy was pretty popular. He was a law professor. I mean that guy wasn't radical or anything like that. He didn't have any ideas like taking over private institutions or private businesses or giving to the poor or anything like that. But they made it like that guy was evil. But, he was pretty popular, among the students especially. So they knew that he was going to win in a landslide, so when people tried to go and vote on November 29, 1987, there were basically power troopers outside just shooting at people. Like, you know, point blank. (Pause). So, that election never came about, because they wouldn't just let people vote.

Furthermore, monetary support of these murderous regimes from the United States led to heavy debts when

the Duvalier regime finally left office. Despite only a small fraction of the aid getting past the pockets of Duvalier, the Haitian government has been forced to repay this fee (Farmer 2003). This outsider impact on Haitian governance leads to what Haitian interviewees have called "business as usual" in which leaders gain office only to get rich at the expense of others. Some believe this outside manipulation of aid also causes those leaders with good intentions to turn into "survival mode," where they must fend for themselves at the expense of the people. And when the U.S. cuts aid because they do not like a Haitian president, the people suffer. One man I interviewed put it like this, "So by not releasing food, by not releasing aid... I mean the government is definitely going to find a way to survive. But the *people*, the people are not going to be able to survive."

One last social process impacting poverty and inequality is the influx of NGOs into Haiti. Research partners frequently lament to me the increasing price of housing in the area to levels far beyond what they are able to purchase. To many I spoke with, this meant settling for houses in areas more susceptible to earthquake damage. Furthermore, the increasing number of NGOs has led to income inequality in once generally equal communities. Interviewees discuss how NGOs throughout each region have taken away workers from the Haitian economy. Along with the list of social processes impacting this vulnerability, ecological processes doing so include deforestation, environmental degradation, poor crop yields, and climate variability. Of all the phrases I heard when asking people about the changes they have



Picture 2. *Lapli pa Tonbe*. A local elder points to the sky emphatically discussing how the rain does not fall.

seen in their lifetime, I almost always heard *lapli pa tonbe*, or simply "the rain doesn't fall," as seen in Picture 2.

Such ecologically and socially fostered poverty and inequality, along with globalization of market economy,

has led to a shift towards urbanization in the years leading up to the earthquake. Despite poor sanitation and unsafe concrete structures, more and more Haitians moved to Port-au-Prince before the earthquake of 2010 simply because they felt they had no other choice.

As a result of these vulnerabilities, death and bodily harm struck the impoverished of Haiti (those with less sturdy building materials) the hardest during the earthquake. Such a selective impact on more impoverished populations results in the perpetuation of these inequalities. This trend has been seen throughout disaster literature, where the more impoverished have increased vulnerability, less resources for evacuation, live in more vulnerable areas, and receive worse treatment because of their race and status (Dyson 2006).

The increased pressure on the urban poor to survive after the death of monetarily supportive family members and the perpetuation of inequality act as a feedback loop to ecological processes, promoting the use of unsustainable practices such as charcoal production. Haitian research partners routinely discuss times of hardship as the primary reason for cutting down trees. Despite their intricate knowledge of the importance of trees (after all, *pyebwa yo se lavi!*), members of the rural poor remark that they are frequently forced to cut down trees they cherish when funerals arise, crops fail, children need school payments, or someone falls ill. To *pou chèche lavi* ("find a living" or "scrape by"), trees are cut down, charcoal is made, and the cycle of deforestation, soil erosion, decreased crop yields, and increased poverty continues.

Poverty, inequality, and poor building materials also lead to such social factors as the need for the vast majority of people in Port-au-Prince to rebuild and/or relocate at roughly the same time following the Earthquake. On the ecological side, this has caused and continues to cause strain on natural resources, sending more people to practice unsustainable practices that ultimately contribute to the poverty and disaster vulnerability of Haitians in rural and urban areas alike. In the days following the earthquake, this Infrastructural Failure also led to transportation and relief difficulties that connect the social and ecological processes of this Failure to those of Resource Failure and Institutional Failure.

Resource Failure- Lack of Food and Water, Poor Resource Allocation

"Although environmental stresses contribute to food insecurity, they do so always in combination with other drivers such as poverty, conflict, and land tenure constraints." (Eriksen 2008:3)

I break down vulnerabilities to the 2010 Earthquake due to resource failures into two categories: lack of food and water, and poor resource allocation. At the social level, I argue that lack of food and water to use in the isolated days following the earthquake is connected to the current Haitian food system and the influx of U.S. food aid. At the ecological level, I argue that the aforementioned issues of climate variability and environmental degradation impact this vulnerability. In terms of poor resource allocation, I link this to both the Infrastructural Failures mentioned above and the Institutional Failures to come.

These processes result in the increased reliance on outside food sources and a lack of readily accessible food surplus to support Haiti in times of isolation. Likewise, these processes impact the coupled ecological processes of Haiti through deteriorating personal and environmental health and the increased need for unsustainable practices.

Trying to get to Port-au-Prince one day after the earthquake, I saw this lack of resource access first-hand. Although I had all of the privileges of a white outsider in the country (a four-wheel drive vehicle, a guide, expendable cash, and the advantages that come with being seen as *blan* [the Creole equivalent to outsider, literally "white" but used more generally]), my travels were thwarted. Gasoline was suddenly not to be found. After searching for hours, I paid \$26 per gallon and headed to the city. Locals could not afford to pay the rough equivalent of a month's wage for a gallon of gasoline to look for loved ones, to get out of the city to get medical help, or to do any of the activities needed after a disaster.

I witnessed other forms of resource failure as I went to hospitals surrounding Port-au-Prince. There, local doctors performed emergency surgeries, including multi-limb amputations, two-days after the earthquake. By this time, they had completely run out of antibiotics and painkillers. I asked what they used during surgeries and was told by a nurse whose eyes spoke of the suffering in the previous days, "ibuprofen."

This lack of immediate medical care and the heavy costs of those goods that were available perpetuated inequality and lack of sustainable environmental techniques, already exacerbated by the flooding of Haitian markets with U.S. crops. Neoliberal agricultural policies and food aid have resulted in drastic changes in foreign food dependence. This can be seen through the percentage of food imported in Haiti, switching from 19% in 1970 to its current level of 51% (Dupuy 2012). Such a change means

that money must be used to purchase food instead of growing it for consumption and monetary gain.

Farmers frequently discuss with me the changing food situation in Haiti. They lament the increase in foreign "chemical foods," as they call them. Locals acknowledge the impacts of this commoditization of food and the consumption of processed food goods. Many link these changes to increases in illness throughout their villages. Such a shift in diet has become so pervasive that many research partners note how their children will not eat the nutritious *pitimil* grain grown around the *jaden lakou*. Instead, they prefer the taste of U.S. rice, which sells for significantly cheaper than local grain products and is less nutritious.

Increases in food purchase, the commoditization of services like education and medicine, and the decreasing economic value of locally grown foods has resulted in increased need to cut trees for charcoal and subsequently increased resource vulnerability through feedback loops from the environment. Outsiders have used such vulnerability as a justification for outside intervention, the promotion of Western farming methods, and the formation of disconnected institutions that prompted Institutional Failure.

Institutional Failure- Inadequate Preparation and Slow Response

At the institutional level, failures presented themselves through inadequate preparation and slow response. I argue that these vulnerabilities are impacted by social processes of militarism, dependency on outside governance, reliance on poor infrastructure, and inequality. The lack of preparation and the slow response of institutions comes partly from the militarism of Haiti, through



Picture 3. A can of oil from US food aid sits in a Haitian field now too dry to grow crops.

which politics have been intertwined with military rule from Haiti and abroad (Kovats-Bernat 2006). This was seen in the days following the earthquake when no relief had yet been cleared through the airport but thousands of foreign military personnel swarmed the streets, "protecting" locals from the chaos and violence that the media had blown out of proportion.

To myself and many of the outsiders present in Haiti during the earthquake, the coordination and effectiveness of unofficial groups of locals did far more during the immediate recovery phase than what was done at the institutional level. And yet, as Miles (2012) notes:

Despite the fact that most Haitians self-organized to provide protection in the parks, empty lots, streets, and other places where people sought safety after the quake, the humanitarian community quickly declared that there was no local capacity to assist with the emergency relief phase. Furthermore, in the midst of their own failures as institutions, the UN and other international organizations referred to these makeshift communities as "squatters" and even accused them of trespassing (Miles 2012).

Media and institutions, overshadowing community resilience and promoting the use of those institutions malequipped to deal with Haiti's complex issues, highlighted this and other "illegal" activities. As Schuller notes, hit and run media accounts focused on "bad news laced with tales of heroic foreigners" (2012). Such a focus, along with inequality between the poor majority and the political/business elite of Haiti, promote what Solnit calls "elite panic" (2009). As a result of this panic and the idea held by institutions that locals lack the capacity to contribute to relief and recovery efforts, outsiders argue this is "justification" for paternalistic modes of outside intervention and the catastrophic "Second Earthquake" in which outsiders have often caused more harm than good through similar and novel Failures.

Step 3: Model The Interactions Between These Influencing Processes

"A full-blown application of complex systems theory in the study of coupled social-ecological systems thus requires modeling highly complex interactions between linked human and ecological systems." (Duit et al. 2010)

As seen in the above quote, literature supports the use of visual models of complex links between social and ecological processes to understand the dynamics at play. In Figure 4, I use a simplified visual representation of how inseparable social processes (blue portion of arrows) and ecological processes (green portion of arrows) connect the infrastructure, institutional, and resource failures dis-

cussed above. These factors combine to form the initial catastrophe vulnerability to the 2010 Earthquake and promote the "Second Earthquake" of recovery.

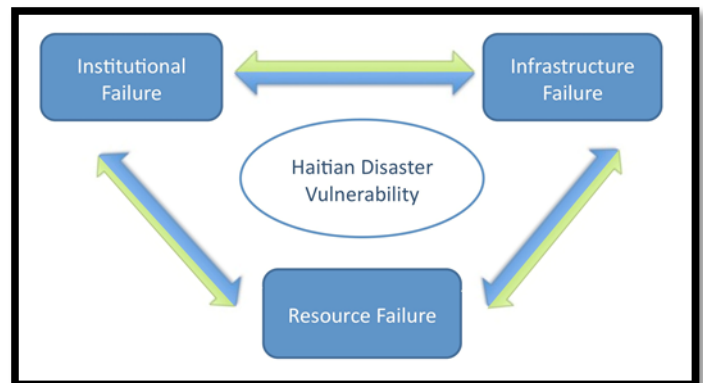


Figure 2. Failures leading to disaster vulnerability

Lui and colleagues also argue for the observation of feedbacks to understand how "people and nature interact reciprocally and form complex feedback loops" (2007:1513). Following the suggestions of this literature, I attempt here to visually model the complex feedback loops leading to Haitian disaster vulnerability. In these feedback loops, human actions result in influences on the environment that then loop back to humans and impact vulnerability. For simplicity sake, I isolate out the infrastructural failures discussed above and visually represent them in Figure 2.

Figure 2 shows how interacting social and ecological processes (blue and green boxes) caused infrastructure failure of poverty, inequality, and poor building material and continue to do so. This infrastructure failure results in social and ecological processes that link back to the original causes and perpetuate this failure. An example of this feedback is poor crops yields (from things like soil erosion and climate variability) leading to increase poverty and inequality, which can cause infrastructure failure. This then leads to the need to rebuild and relocate in affordable (but more vulnerable) areas. This type of interconnectedness between social and ecological factors demonstrates the value of the Coupled Social-Ecological Systems, in which separation between social and ecological processes is seen as arbitrary and often misleading (Berkes and Folke 2000). Connecting this back to Figure 2, this then impacts institutional and resource failures and ultimately catalyzes Haitian disaster vulnerability through environmental feedback loops and leads to the "Second Disaster" currently underway.

Furthering Perspectives

McGreevy

Haitian Disaster Vulnerability

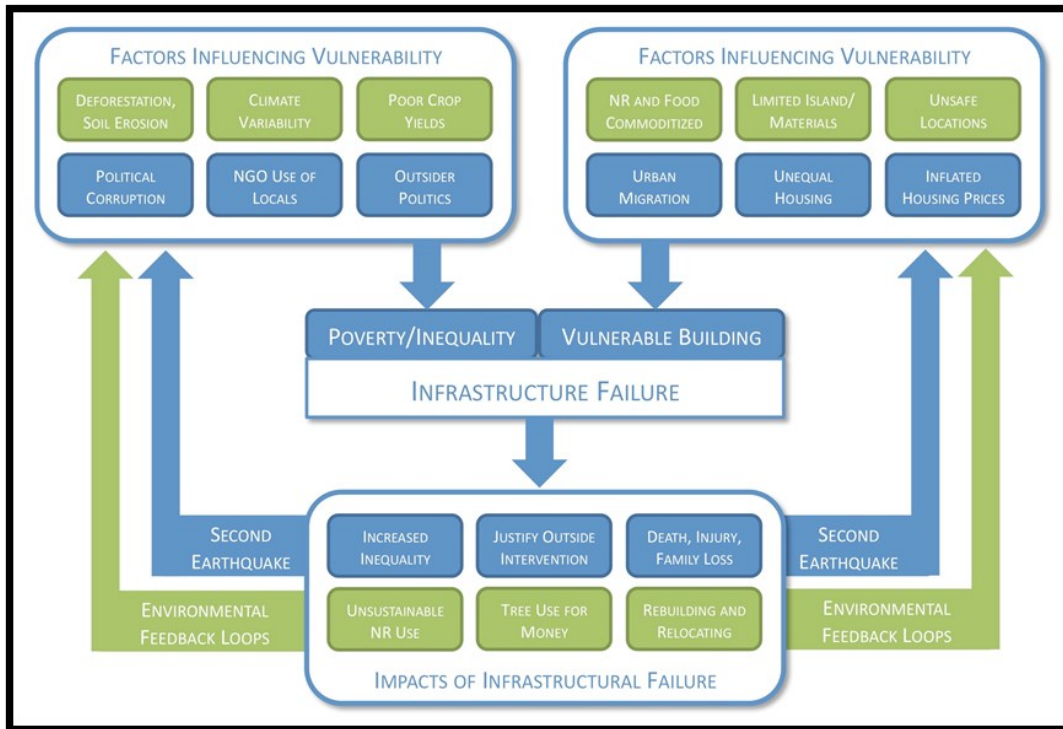


Figure 3. Representation of Infrastructure Failure through Social-Ecological Processes (NR= Natural Resources)

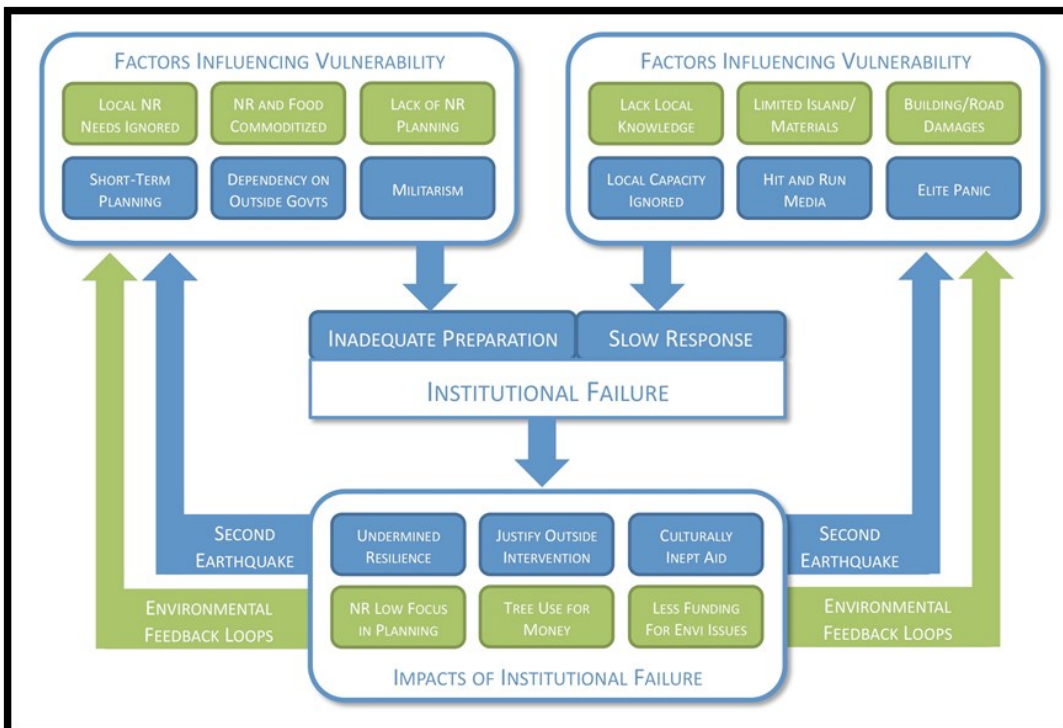


Figure 4. Representation of Institutional Failure through Social-Ecological Processes (NR= Natural Resources)

Furthering Perspectives

McGreevy

Haitian Disaster Vulnerability

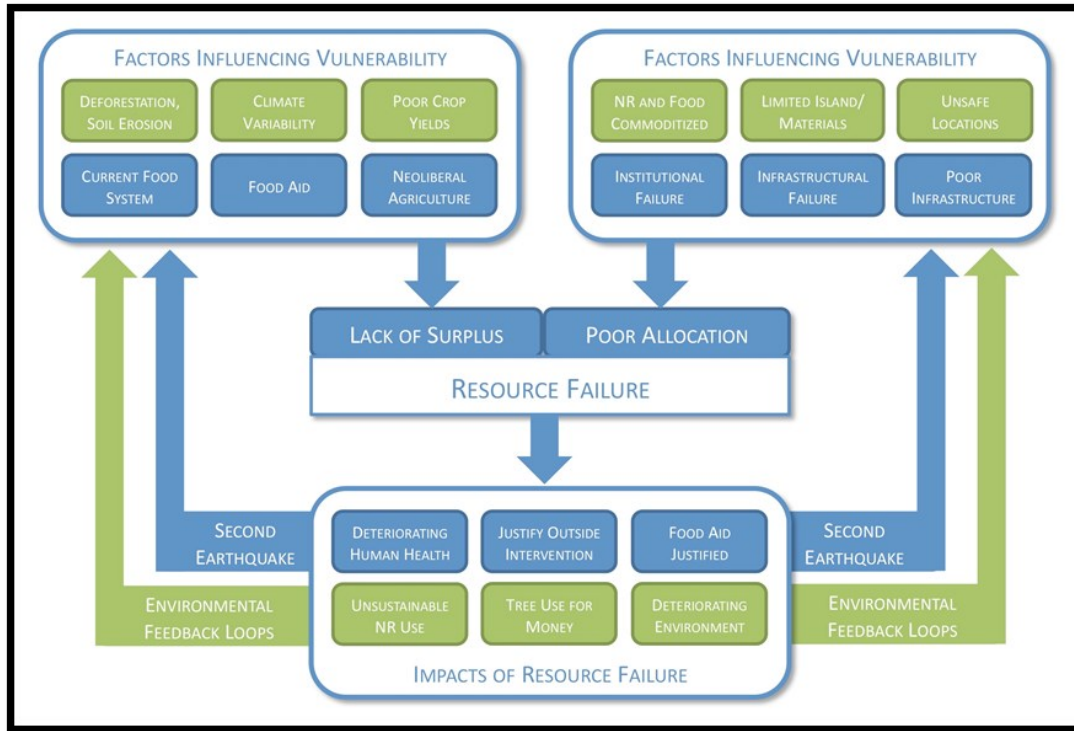


Figure 5. Representation of Resource Failure through Social-Ecological Processes (NR= Natural Resources)

Figure 4 and Figure 5 similarly show how interacting social and ecological processes (smaller boxes) caused and continue to perpetuate institutional and resource failure. I present institutional failure through inadequate preparation and slow response and resource failure through lack of surplus and poor resource allocation. Given their connected nature, many social and ecological processes impact multiple failures. These visual representations seek not to provide a complete assessment of impacting factors of the Haitian Earthquake of 2010. Instead, I use them to demonstrate the interconnected nature of social and ecological processes in Haiti. Understanding these connections can help groups involved understand how to stop cycles that increase disaster vulnerability and lower quality of life in Haiti.

Concluding Suggestions

Since the discussion of the "Second Earthquake" and its implications are beyond the scope of this paper, my first recommendation is to use similar methods to tease out the ecological and social processes involved in Haitian disaster response and recovery efforts. These can then be mapped out in visual feedback loops to help locate which processes must be addressed in order to ame-

liorate the situation and cease the perpetuation of Haitian disaster vulnerability. Aspects to consider include disaster myths of elite panic and the need for militarism, the history of militarism in Haiti, and the assumed benevolence of Western NGOs in Haiti's current status as "The Republic of NGOs" (Schuller and Morales 2012).

Similarly, I echo the call for anthropologists to use locally appropriate environmental measures that may not fit into the dominant, western system of knowledge (Thomas 1998). To do so, we must work with local peoples dependent on natural resources for their livelihood. As anthropologists and ecologists have noted, these local peoples "are often able to assess the health of the environment and the integrity of the ecosystems better than any evaluator from the outside" (Berkes 2008:42). Such a mindset, focusing of feedbacks from the environment, can promote reduced vulnerability and increased resilience. As Erikson (2008) notes, resilient systems are always learning and adapting to errors of the past in ways that can promote sustainable resource use.

To manage resources in Haiti and manage the disaster vulnerability that I argue is closely linked to these resources, we must then learn from our mistakes. Outsiders must acknowledge how social and ecological processes

impact Haiti at the local and international level and across temporal scales. This can be seen through the Coupled Social-Ecological Systems approach, in which nonlinear, interconnected social and ecological processes impact one another through complex feedback loops. These feedback loops perpetuated the Infrastructural, Institutional, and Resource Failures that increased Haitian vulnerability to the 2010 Earthquake. Using local knowledge to understand Haiti as a Coupled Social-Ecological System can lead to more reflective and adaptive changes in outsider mindset and local policy that can promote a less vulnerable and more resilient Haiti.

Acknowledgments

To my advisor, Kate Browne, thank you for all of your support and guidance through my research. Thank you to Ed, Robin, Kim, and everyone at the Center for Collaborative Conservation. Without your help, this research would not be possible. Thanks to Laura, Jeannie, Lincoln, Mary, and Sebas for being the best group I could ask for. Thank you Aunt Deb for getting me interested in Haiti, and the support of my wonderful parents for keeping my passion going. Thank you Lori Peek for the methods training and all of the other Colorado State professors who have guided my learning. Thank you Melissa Basta and all of my Haitian friends that have helped me with Creole. Thank you Elisson, Jean Marie, Ernzo, Celarus, and Llama for helping me through Haiti. Thank you Dharma, Paul, and Lucy for opening up your home to me. And most importantly, thank you to the people of Haiti who have offered me valuable time and knowledge. You continue to be my professors and I your student of Haiti. And to Bondye, thank you for the protection. Mesi anpil.

References

- An, L., D. López-Carr
2012 Editorial: Understanding human decisions in Coupled Human-Nature Systems. *Ecological Modeling* 229(24): 1-4.
- Bankoff, Gred
2007 Comparing Vulnerabilities: Toward Charting an Historical Trajectory of Disasters. *Historical Social Research* 32 (3): 103-114.
- Berkes, Fikret
2008 *Sacred Ecology*. New York: Routledge.
- Berkes, Fikret and Carl Folke
2000 *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge University Press: Cambridge.
- Bermejo, Pedro Mas
2006 Preparation and Response in Case of Natural Disasters: Cuban Programs and Experience. *Journal of Public Health Policy* 27 (1): 13-21.
- Charmaz, Kathy
2006 *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. Thousand Oaks, CA: Sage Publications.

Duit, Andreas Duit, Victor Galaz, Katarina Eckerberg, Jonas Ebbesson.
2010 Governance, complexity, and resilience, *Global Environmental Change* 20(3): 363-368.

Dupuy, Alex
2012 *The Neoliberal Legacy in Haiti*. In *Tectonic Shifts: Haiti Since the Earthquake*. Stylus Publishing: Stylus, Virginia. 23-26.

Dyson, Michael Eric
2006 *Frames of Reference: Class, Caste, Culture, and Cameras*. In *Come Hell or High Water: Hurricane Katrina and the Color of Disaster*. New York: Basic Civitas Books. 141-177.

Ericksen, P.J.
2008 What is the vulnerability of a food system to global environmental change? *Ecology and Society* 13(2): 14.

Etienne, Yolette
2012 *Haiti and Catastrophes: Lessons Not Learned*. In *Tectonic Shifts: Haiti Since the Earthquake*. Stylus Publishing: Stylus, Virginia. 27-34.

Farmer, Paul
2003 *The Uses of Haiti*. Monroe, ME: Common Courage Press.

Farmer, Paul
2011 *Haiti After the Earthquake*. Philadelphia: PublicAffairs.

Gill, Duane A., J. Steven Picou, and Liesel A. Ritchie
2012 *The Exxon Valdez and BP Oil Spills: A Comparison of Initial Social and Psychological Impacts*. *American Behavioral Scientist*. 56(1): 3-23.

Ingold, Tim
2000 *The Perception of the Environment: Essays in Livelihood, Dwelling and Skill*. London: Routledge.

Kovats-Bernat, Christopher
2006 *Factional Terror, Paramilitarism and Civil War in Haiti: The View from Port-au-Prince, 1994-2004*. *Anthropologica* 48 (1): 117-139.

Latortue, Paul and Doel Vazquez
2006 *Gonaives The Last 50 Years*. *Caribbean Studies* 34 (1): 262-274.

Liu, Jianguo, Thomas Dietz, Stephen R. Carpenter, Marina Alberti, Carl Folke, Emilio Moran, Alice N. Pell, Peter Deadman, Timothy Kratz, Jane Lubchenco, Elinor Ostrom, Zhiyun Ouyang, William Provencher, Charles L. Redman, Stephen H. Schneider, and William W. Taylor
2007 Complexity of coupled human and natural systems. *Science* 317 (5844):1513-1516.

Marin, Andrei
2010 *Riders under storms: contributions of nomadic herders' observations to analyzing climate change in Mongolia*. *Global Environmental Change* 20:162-176. Marshal, Martin N. 1996 Sampling for qualitative research. *Family Practice* 13(6):522-525.

Maternowska, M. Catherine
2006 *Reproducing Inequities: Poverty and the Politics of Population in Haiti*. New Brunswick: Rutgers University Press.

Miles, Melinda

2012 Assumptions and Exclusion: Coordination Failures During the Emergency Phase. *In* Tectonic Shifts: Haiti Since the Earthquake. Stylus Publishing: Stylus, Virginia. 45-48.

Murray, G.F. and M.E. Bannister

2004 Peasants, Agroforesters, and Anthropologists: A 20-Year Venture in Income Generating Trees and Hedgerows in Haiti. *Agroforestry Systems* 61: 383-397.

Rubin, Herbert and Irene Rubin

2012 Qualitative Interviewing: The Art of Hearing Data. Los Angeles: Sage.

Schuller, Mark

2012 Killing With Kindness: Haiti, International Aid, and NGOs. New Brunswick: Rutgers University Press.

Schuller, Mark, and Pablo Morales

2012 Tectonic Shifts: Haiti Since the Earthquake. Stylus Publishing: Stylus, Virginia.

Sillitoe, Paul

1998 What Know Natives? Local Knowledge in Development. *Social Anthropology* 6(2): 203-220.

Smith, Jennie M.

2001 When the Hands Are Many: Community Organization and Social Change in Rural Haiti. Ithica, NY: Cornell University Press.

Smith, Jennie M.

2004 Singing Back: The Chan Pwen of Haiti. *Ethnomusicology* 48 (1): 105-126.

Solnit, Rebecca

2009 A Paradise Built in Hell, The Extraordinary Communities That Arise in Disaster. New York: Penguin.

Spense, Mark

1999 Dispossessing the Wilderness. Oxford: Oxford University Press.

Sprenkle, Starry D.

2008 Community-Based Agroforestry as Restoration: The Haiti Timber Reintroduction Project Methods and Framework. *Ecological Restoration* 26 (3): 201-203.

Thomas, B.R.

1998 The evolution of human adaptability paradigms: Toward a Biology of Poverty. Pp. 43-74. *In*: Building a new biocultural Synthesis. Political-economic perspectives on human biology. A.H. Goodman and T.L. Leatherman, eds. University of Michigan Press, Ann Arbor.

Thornton, P.K., P G Jones, PJ Ericksen and AJ Challinor

2011 Agriculture and food systems in sub-Saharan Africa in a 4 C+ world. *Philosophical Transactions of the Royal Society A* 369: 117-136.

Trouillot, Michel Rolph

1990 Haiti State Against Nation: Origins & Legacy Duvalierism. New York: Monthly Review Press.

U.S. Geological Survey (USGS)

2012 Earthquake Facts and Statistics. Earthquake Hazards Program. <http://earthquake.usgs.gov/earthquakes/eqarchives/year/eqstats.php>

BRINGING IT ALL BACK HOME: THE RE-LOCALIZATION OF FOOD AND ITS IMPACTS ON COMMUNITY RESILIENCE

MARK R. STEINBUCK

ABSTRACT

This study draws causal links between the re-localization of social-ecological food systems and community resilience. With evidence from two case studies, the Nimiipuu of Idaho and an urban community in Cuba, it is argued that horizontal and vertical linkages of scale create necessary networks that provide a medium for social learning, ultimately resulting in a more resilient social-ecological system. It is cautioned that extreme localization is an ideal rarely ever seen in history, as it has the potential to expose a system to high amounts of political, economic and environmental vulnerabilities. However, as is consistent with the food sovereignty movement, local communities must retain the agency to decide and craft their own scalar linkages based upon their unique historical and cultural contexts, and so the local scale should be the starting point of all policy decisions that affect the subsistence production and consumption of individuals within communities. Gaining power over a community's food system is not the end in itself, but rather a means by which a community can build resilience, attain social justice, and craft a meaningful cultural connection to the environment in which it dwells.

Worldwide, the modern industrialized socio-economic system of capitalism has resulted in individuals divorced from their local food-systems, driving communities towards reliance on heavily processed and far-travelling foods. This has resulted in widespread environmental degradation and the loss of community identity associated with place (Milestad *et al.* 2010). This issue, although experienced almost everywhere, has met with resistance from some communities in both core and peripheral regions, resulting in a rejection of the less favorable aspects of globalization and in favor of a re-localization of food consumption and production.

The various socio-political changes that globalize food directly impact ecological systems and cultural perceptions of identity and place. A political ecology-based analysis provides a window into the complexities of global and local level social-ecological food systems and how they each contribute to ecological and community vulnerability or resilience. Through this lens, this paper considers the merits (and detractions) of the concept of "localism" as it pertains to food systems and social-ecological resilience. Two case studies are considered, the first concerning the Nimiipuu (Nez Perce) tribe, traditional fisher-hunter-gatherers in the Columbia-Snake River valley of Idaho, and their use of rapidly declining salmon stocks (Colombi 2012). The second discusses the use of home gardens in response to economic depression in the urban areas of Cuba (Buchmann 2009).

It will be argued here that the re-localization of food systems, i.e. the partial divorce of a community's

subsistence (be it hunting, gardening or agriculture) from the globalized industrial agricultural complex, overwhelmingly increases community adaptive capacity and attachment to place. This can only be attained by maintaining necessary inter-scalar networks and appropriate allocations of power. This in turn increases resilience towards shifting ecological and social-economic conditions such as food security, wealth and environmental sustainability.

Political Ecology and the Issue of Scale

The lens of political ecology lends great value to the investigation of the dynamics of a food system. Political ecology, in short, focuses on issues of political scale, or "local populations embedded in larger political economies" (Buchmann 2009: 705) which have bearing on the use of natural resources or perceptions of the environment. Themes considered in this discipline include: power and agency; regions and space; landscapes; and scale itself. These themes will be briefly discussed to provide clarification of the meanings of terms and concepts used here.

As political ecology focuses on the use of natural resources, the question of whom is controlling the resources and to what end (policy creation, environmental management, etc.) is central to its framework; this control is theorized as "power" (Neumann 2009; Hajjar *et al.* 2012). Power is wielded by and traded between actors, which can range from non-state actors like individuals and local organizations, to large-scale governing bodies and NGOs, international lending institutions, or state-

level governments. The difference in affiliation, size and power between these actors is what creates a politics of scale (Neumann 2009). How these different actors are organized into a field of relations gives rise to agency, which is the habitual social interaction between actors over time (Moore and Westley 2011: 5). Within the context of food systems, actors are food producers and consumers (individual or en masse), policy makers etc., and the potential usage of power by these actors characterizes the agency of each actor.

Relationships and the historical context of power are what define "regions" in space to the extent that society and nature are both produced and reproduced by these social relations of power (Neumann 2010). Spaces or regions that produce or consume specific foodstuffs exist the way they do because of the social power relationships that govern them, and it is this social production which political ecology is most interested in (Neumann 2010).

Landscape is a much more complex concept because usage of the word varies considerably pending on the cultural and theoretical context. The most universal understanding of landscape is not much different than that of region, in that it is a physical space where environmental services (like food, water or timber) exist, which is socially produced through labor (Matthews and Selman 2006: 200). However, most theorists see landscape as also including symbolic meanings created through labor, or "landscape as lived, embodied, and practiced," (Neumann 2011: 844). By this, the meaning of the everyday mundane life of actors constitutes landscape, and if taken a step further, so are the reasons why those actors exist within that landscape at that time, which boils down to issues of political economy (Neumann 2011). Most social scientists would contend that all landscapes are cultural landscapes, as various forms of human-generated capital have influenced mostly every "natural" landscape. These categories of capital include: natural capital (usable biophysical resources); cultural capital (skills, perceptions and traditions created to mediate the environment); economic capital (money, employment, business); and social capital (trust and networks between actors, potential for learning, knowledge) (Matthews and Selman 2006: 204; Buchmann 2009: 710).

Scales are simply hierarchies of socioeconomic organizations within which capital and power flow bi-directionally (Neumann 2009). The reason why scale is paramount is because complex human-environment problems, such as food production, usually require multiple levels within multiple scales (e.g. social, political, geographic) to operate in synergy with power concentrating

at appropriate levels within each scale. Understanding where power should be concentrated and what linkages are made is essentially the confounding problem addressed in this paper when considering the "localness" of food production.

Vertical linkages, or "scaling up" decisions and networks on small levels like "individual" or "community" to larger levels like "state" have the potential to amplify social networks and innovation, which facilitates learning and knowledge creation between these levels (Galvin 2009; Moore and Westley 2011). Horizontal linkages, or "scaling out", broaden the system by distributing these innovations across different socio-economic boundaries so that knowledge and goals are shared within different organizational regimes, be it political, kinship, economic etc. (Galvin 2009; Moore and Westley 2011). Linking these scales takes considerable planning and effort by actors in a food system, and when this planning and negotiation fails, power becomes inefficiently allocated to the detriment of the social-ecological system. As power can flow bi-directionally, it is not always the case that linkages between all scales and levels are ideal, nor is it usually the case that scalar isolation is ideal. The specific context of the problem dictates the scalar necessities, and it is often unknown what the proper formula is. With this question in mind, the theories of localism, globalization and decentralization will be discussed.

The Governance of Food: Globalization versus Localization

As was mentioned earlier, the industrialized global market economy currently holds power of most of the world's food production, and can be characterized as a political-economic "macroclimate" of neoliberalism (Ayres and Bosia 2011: 50). This does not imply that local modes of production, or "microclimates", do not exist. Rather, most localities are highly specialized (through monoculture and other strategies) to feed the demands of global needs, instead of being generalized enough to satisfy the demands of local subsistence or cultural needs (Colombi 2012).

In terms of scale, this means that power is concentrated at such high levels that natural capital is flowing unidirectionally from low levels to high-levels of socioeconomic scale, as in the shipment of peasant-grown agricultural products to large multi-national supermarket chains in core countries. Similarly, economic capital is being reinvested into local economies through government subsidizing of inputs (e.g. genetically modified seed), only to be re-extracted through the consolidation

of land and business ownership by foreigners (Ayres and Bosia 2011). Such externally dominated, unbalanced economic inputs in tandem with natural resource extraction results in dramatic structural changes in the local social-ecological system, which becomes extremely brittle and vulnerable to collapse (Galvin 2009: 187).

Globalization-style development strongly favors asymmetric power relations in spatial scale. Top-heavy relationships, be they development-based or conservation-based, generally favor those that operate at the national and international level while local and indigenous communities pay most of the long-term costs with the forfeiture of land, power and money (Zia *et al.* 2011). This is a fundamental problem because ownership of, or at least access to, natural resources is a high priority for local practices around the world concerning both commercial production as well as personal consumption (Hajjar *et al.* 2012).

Asymmetries in the food network have spawned resistance and revitalization movements worldwide, with a slew of new buzz words attached, including "localism" and "food sovereignty." These movements are essentially social-ecological secessionist movements created by farmers, peasants, indigenous peoples or outsider social interest groups aimed at divorcing the forces of global capitalism and agribusiness from the local political economy (Ayres and Bosia 2011). By re-localizing production, agency shifts from high-level actors to low-level actors. Producer communities become producer/consumer communities leaving supply and demand to be internally regulated, thus enabling a higher degree of self-determination.

When food networks are localized, social-ecological changes ensue. In general, sites of food production shrink in size while crop or faunal biodiversity increases (Milestad *et al.* 2010). In the forest communities of Mexico and Brazil, for instance, Hajjar *et al.* (2012: 10) show that increasing local autonomy is positively correlated to both high forest carbon levels and livelihood benefits. External inputs, such as pesticides, fertilizers, preservatives and fossil fuels reduce dramatically because food is grown, processed, sold and consumed within one locality, thereby reducing the amount of time and resources spent per calorie of food (Milestad *et al.* 2010). Additionally, economies become relatively closed or introverted as money spent locally is transferred to other local hands. The state of Vermont, for example, hosts the most robust local food network in the United States, yet even a 10% shift in dollars from globally produced food to locally produced food would net local producers, processors and distribu-

tors in the state an additional \$100 million annually (Ayres and Bosia 2011: 55). Money in an open, global system disperses into the trickle-down profit hierarchies of corporations, which generally never reinvest these profits into consumer localities.

Franklin *et al.* advocate a reflexive approach to localism where strong alliances between localities, or horizontal linkages, are supported (2011: 784). Franklin *et al.* make the argument that extreme localization of food sourcing, such as their case study of local food hubs in Stroud, UK, leaves seasonal transitions low in resources and high in vulnerability, as staple foods cannot always be produced locally at all times (2011: 782). Extreme localization is an idealized example of a system with plentiful resources, some horizontal and few vertical scalar linkages. In a more realistic scenario seen all throughout human history and pre-history, trade networks not only within localities, but between localities need varying amounts of horizontal and vertical linkages to supplement for resource shortages as well as collective solidarity and protection.

When considering the scalar politics of localization, it is imperative to consider the agency of power holders and the transfer of power between actors. Neumann (2009) remarks that scale is often under-theorized in political ecology such that the local scale is commonly assumed to be more socially just and environmentally sustainable, when that may not always be the case (2009: 400). Franklin *et al.* coins this assumption the "local trap," (2011: 776). In some cases it can be shown that the devolution of power into the hands of locals can lead to severe overexploitation of natural resources or social exclusion, where other cases show resource conservation (Hajjar *et al.* 2012; Franklin *et al.* 2011).

The "local trap" is created out of disregard to a case's specific historical contextualization of power, agency and scalar linkages, i.e. the cultural landscape. It is not merely an issue of devolving power and rights, but rather where power can be sustainably concentrated in relation to various capital resources. If natural, social, cultural and economic capitals are all strong on the local level, power can mostly likely be sustainably devolved. If there is little capital, incentives or support at this level, the outcome will likely not be successful (Hajjar *et al.* 2012). This latter scenario is a common occurrence in neoliberal decentralization policies, where centralized governments rapidly devolve power to non-state actors and institutions, such as private landholders, corporations or local community governments (Hajjar *et al.* 2012: 1). In theory this devolution improves efficiency by dispersing natural resource

decision making rights. However, if the proper capitals are not in place, or if local forms of capital are not validated by the state, power becomes re-concentrated in the hands of a privatized, autocratic oligarchy, which ends up accentuating the excesses of capitalism (Ayres and Bosia 2011: 48). Such a system would look exactly like today's mainstream globalized agribusiness.

The paradox of localization is that it has the potential to enable self-determination while at the same time fragmenting previously collective and powerful voices (Ross and Pickering 2002). When considering that there are multiple communities even within localities, such as indigenous and non-indigenous people inhabiting small regions, a lack of state power eliminates minimum standards of resource protection as well as protections of minoritized groups within localities (Hajjar *et al.* 2012).

Food Sovereignty

These issues of localization have been considered and mitigated by peasant farmers and their advocates for decades within the food sovereignty movement. The term "food sovereignty" was coined by the international farmer and peasant collective Via Campesina in 1996 to unify a fractured movement of small food producers and local food consumers against large scale agribusiness and global neoliberal policy (Ayres and Bosia 2011: 48). Ayers and Bosia provide a definition of food sovereignty as the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; *to determine the extent to which they want to be self-reliant.* (2011: 50 emphasis added).

The definition of food sovereignty counters the multitude of problems with localism by suggesting that local communities can readily evaluate their own scalar necessities and may link vertically or horizontally as they see fit without retribution. Although the food sovereignty movements themselves operate on all levels of all scales, the re-localization of food is not the end goal, but rather is seen as a means towards the ends of social-ecological resilience and social justice (Milestad *et al.* 2010).

The food sovereignty movement's call for flexibility in self-reliance is considerate of different historical contexts of power and agency as well as different cultural values held in different localities. Communities view the struggle for self-determination in opposition to different forces of global values, as it is suggested by Ayres and Bosia (2011: 60) that there are in fact multiple globalizations and therefore multiple culturally created forms of local re-

sistance. This notion will be validated later in the two case studies considered in this paper.

But to speak more in generalities, the values of localism that define resistances are highly variable, from romantic notions of returning to a simpler time where the source and quality of food was well known, to more progressive entrepreneurial goals of rejecting commodification, mechanization and excessive capitalism. These differing emphases stem from different cultural complexes which mediate peoples' interactions with environment and place.

Food sovereignty movements often stem from local cultural values which tend to want to preserve valued cultural landscapes, such as traditional rural production or hunting and gathering landscapes. These values and cultural meanings, which often derive from interacting with place (Basso, referenced in Davidson-Hunt and Berkes 2003), necessitate some level of re-localization of food production, consumption, and governance (Matthews and Selman 2006). Food systems which pander entirely to international markets using industrial production methods not only sows an incredibly high amount of vulnerability into the local social-ecological system, but also alienates many traditional cultural values, increases personal debt, decreases biodiversity and maximizes volatile inputs like pesticides (Lackett and Galvin 2008).

Food and Social-ecological Systems

It has been suggested in this paper that the food system is a classic example of a social-ecological system. It will now be considered how aspects of knowledge, learning and social networking work within local food systems towards attaining the goal of community resilience. In brief, the understanding of a social-ecological system is similar to the definition of cultural landscape, but with a strong emphasis on system change, resilience and adaptability (Matthews and Selman 2006: 203). Besides the fact that it considers humans to be intrinsic to the system, the distinguishing factor between a social-ecological system and an ecological system is that human institutions of knowledge, social networks and governance are the adaptations that predominantly affect the resilience of the integrated system (Matthews and Selman 2006).

Indicators of system resilience are often cited in the literature according to Folke's four categories: learning to live with change and uncertainty; nurturing diversity for reorganization and renewal; combining different kinds of knowledge; and creating opportunity for self organization (as referenced in Buchmann 2009: 707; Moore and Westley 2011; Franklin *et al.* 2011; and others). It is these last

two categories concerning social learning and governance that will be considered presently.

Social learning is an adaptive cognitive process between social agents within a system which shares knowledge of how to collaborate with one another, and how to interpret the meaning of phenomena and the field of relationships that exists in a system (Davidson-Hunt and Berkes 2003; McCarthy *et al.* 2011). Social learning is essentially a mechanism of change in social structures, and it is the vehicle by which individuals create vertical and horizontal scalar linkages.

Milestad *et al.* (2010) conceives of three types of learning known as instrumental, communicative, and emancipatory. Instrumental learning involves learning how to control and manipulate a social-ecological system, be it plants animals or people, such as when a farmer learns what crops to grow or when a consumer learns what crops are available and from whom (Milestad *et al.* 2010: 6). Communicative learning develops understanding about other actors' values and priorities, and so more culturally meaningful relationships are created (Milestad *et al.* 2010: 6). Lastly, emancipatory learning is a reflexive form of learning, where one's own skills and place in the system is understood (Milestad *et al.* 2010: 6).

The goal of social learning within a social-ecological system is ultimately adaptive capacity. The more an agent in a system knows about their field of relationships, the human and natural processes that occur around them, as well as their own capacities to act within that system, the more that agent will respond efficiently in times of crisis (Milestad *et al.* 2010). Likewise, the more an agent understands and critically reflects upon the power relations that create policy and systems of governance, the more these structural barriers can be challenged (McCarthy *et al.* 2011).

Social learning relates to the re-localization of food argument because it is at these low levels of scale that the most immediate feedbacks in a system exist. When transactions of food are face to face as in a local farmer's market or during a hunt, social-ecological feedbacks are the most robust (Milestad *et al.* 2010). People relate lived, everyday experiences with each other, recounting the weather, the number of species seen in a particular area, foods that are desired by the local community, conditions today relative to yesterday – all information which can potentially buffer a local food system to shocks like species extinction, market dips, and political change. When the memory and knowledge of a community is increased, so is the adaptive capacity of the system as a whole (Davidson-Hunt and Berkes 2003). When ecological con-

ditions become so unpredictable or complex that a community cannot adapt quick enough, the memory becomes outmoded and the system has to change (Coughenour 2008).

However, given less extreme conditions, social networks will reproduce knowledge, trust between actors, and the conduit-s of learning as long as the system stays intact (Moore and Westley 2011). In many cases recounted in the literature, food producers and consumers who were able to directly communicate with each other developed more trust in the values of the other person, as well as the quantity and quality of food available, which positively influenced both learning and adaptive capacity (Milestad *et al.* 2010; Colombi 2012; Buchmann 2009; Franklin *et al.* 2011).

What this discussion about social learning and networks results in is a foundation for community resilience through local food networks. Communities that develop strong internal bonding and external bridging linkages have a relatively high capacity to withstand external shocks while still maintaining the basic structure of the system, while at the same time having the capacity to reorganize a system when it is not serving the needs of the people and environments within it. Local food networks distribute more than just food, but are also a means by which people connect to each other, reproduce knowledge, and reinforce community values (Franklin *et al.* 2011).

Case Study 1: The Nimiipuu and the Salmon

The case of the Nimiipuu and their relationship to salmon, as related from Colombi's (2012) "Salmon and the Adaptive Capacity of Nimiipuu (Nez Perce) Culture to Cope with Change," has been selected to illustrate the relationship between the re-localization of food and community resilience because of the unique and relatively intimate connection that this group has with its food system, even in the face of rapid development. The Nimiipuu tribe lives in the Columbia-Snake River Valley region of Idaho. Similar to that of many other Native American tribes, their culture is physically and spiritually dependent upon a few wild food sources (Watson *et al.* 2011). As the tribe relies heavily on a fishing-hunting-gathering subsistence economy, the cultural keystone species which structures the Nimiipuu social-ecological system is the salmon – a species without which the Nimiipuu say their culture would cease to exist (Colombi 2012: 75).

For over four hundred years since European colonization, the Nimiipuu have been adapting their traditional economy in response to both natural and constructed

social-ecological changes including rapid population declines, multiple federal treaty negotiations, hundreds of dams built on their rivers, and most recently their leadership in restoring decimated salmon populations (Colombi 2012: 77).

The Nimiipuu cultural landscape consists of labor, ceremony, subsistence and a deep cultural attachment to place, fish and water (Colombi 2012). Social networks are formed through the regional trade of fish and other wild-caught resources, as well as both mundane meals and ceremonial feasts revolving around salmon (Colombi 2012). Identity is so closely tied to place and the consumption of explicitly local salmon that families who still consume a majority of wild caught foods are seen as traditional, spiritually strong, and all-around authorities on Nimiipuu culture (Colombi 2012: 83). The memory of traditional culture is continually reproduced through both mundane and ceremonial interaction of people, land and food.

In recent history, the waterways of the Columbia-Snake River Valley have been inundated with non-native fish species such as carp, walleye, and bass, none of which are used by native fishermen because of their stigmatized extra-local origin; the only fish more objectionable are store-bought (Colombi 2012: 84). A much more dramatic change in the cultural landscape has arisen from a bi-directional onslaught of industrial agriculture and energy development, which have worked in synergy to decimate the local salmon population. It was estimated during the Lewis and Clark expedition of 1805 that roughly 50,000 Native-Americans sustainably fished eighteen million pounds of salmon out of the Columbia River each year (Ross and Pickering 2002: 195). Prior to the development of the dams after World War II, ten to sixteen million salmon returned to the Columbia-Snake River watershed each year (Colombi 2012: 87). Today, after concrete structures have fragmented the riparian systems and agricultural runoff has poisoned the waters, roughly 200,000 individual salmon swim up the river each year, one tenth of the height of the population (Colombi 2012: 87). Expectedly, the agricultural runoff comes from non-locally owned industrial monoculture wheat fields, 0% of which is sold locally and 90% of which is sold to China (Colombi 2012: 88).

In response to these threats on local sovereignty, the Nimiipuu have used their cultural values to guide restoration efforts in restoring native salmon and riparian habitats through the creation of natively managed fisheries (Colombi 2012: 89). As the tribe has limited power on the surrounding lands outside of their reservation bounda-

ries, the Nimiipuu have actively scaled out their social network by collaborating with other local level institutions to create the Columbia River Inter-Tribal Fish Commission (Colombi 2012: 89). Additionally, the commission has drafted a plan, the *Wy-kan-ush-mi Wa-kish-wit* ("the Spirit of the Salmon"), which creates vertical linkages with federal policies like the Endangered Species Act (Colombi 2012: 89). By doing so, new forms of knowledge can be combined between policy makers, scientists, and local knowledge holders; learning will follow from the creation of trust and partnerships between these inter-scalar agents.

Even though the end goal of these partnerships is local ecological and community resilience, by critically reflecting on their own situation, the Nimiipuu decided that they had little power within their locality to challenge the extremely high-level agro-development interests threatening their culture. Furthermore, the salmon themselves migrated across multiple physical and cultural boundaries, so multiple social, political and economic scales were already linked (Colombi 2012: 93). To serve this condition, the effective management of this resource required strong formal horizontal linkages with other communities, native and non-native, who resided within the Columbia-Snake River watershed. By scaling up towards the federal level, the Nimiipuu and many other Native American tribes have found a way to circumvent unallied agents such as state government, corporations and dissenting non-native communities (Ross and Pickering 2002).

All of the theoretical indicators show that the Nimiipuu have a high chance for ecosystem revitalization through their re-localization efforts, but the fact that this study was published within the past few months leaves the results of their efforts unknown.

Case Study 2: Urban Home Gardens in Cuba

The case of Cuba's urban home gardens is presented because it is strikingly different than the Nimiipuu case. As Buchmann (2009) relates in the article, "Cuban Home Gardens and Their Role in Social-Ecological Resilience," Cuban urbanites' attachment to place and their opposition to forces of globalization are entirely different than that of Native Americans. The population is culturally heterogeneous, they are not immersed within a conventionally "natural" system, and that which they do consume is a mixed economy of domestically grown food supplemented by state-subsidized food instead of things hunted or gathered. Further, the movement towards localization is almost entirely due to unstable economic condi-

tions inherent to Cuba's isolated socio-economic condition in the world, and not primarily because of strong cultural drivers (Buchmann 2009).

The tradition of smallholder food production in Cuba began in the post-revolution era after large private estates were divided and distributed to poor agricultural laborers (Buchmann 2009). These sources of production still fuel much of the local food in urban Cuba, but a surprising large amount actually comes from patio gardens, backyards, and windowsill plants, totaling over 800,000 tons of agriculture produce in 1999 (Buchmann 2009: 706). Despite Cuba's sullied political reputation in the United States, the proliferation of these smallholder subsistence strategies made Cuba the only Latin American country to eliminate hunger for 30 years following the revolution in 1959 (Buchmann 2009: 706).

Due largely to Cuba's unpredictable economy in tandem with its extremely onerous federal taxes on commercialized goods, home garden systems are adopted by individuals as a free and predictable supplement to the state-run markets (Buchmann 2009: 707). The mosaic of concrete and small plant communities creates a new social-ecological system featuring high biodiversity (182 species counted), low vulnerability to disturbance in climatic or market forces, and a very interconnected social network structured around neighborhoods (Buchmann 2009). The relatively small cost of labor associated with gardening and a complete lack of subsidies or inputs makes the system extremely self-sufficient.

Not only are the gardens used to grow food crops, which actually only make up 23% of the mix, but also to grow medicinal plants (39%), ornamental plants (24%), and plants only used for ritual purposes (13%) (Buchmann 2009: 711). It is the underground medicinal plant economy that reveals the strong bonding linkages present within the Cuban urban neighborhoods. As it is illegal to sell anything without a license in Cuba, medicinal plants are bartered and gifted within small urban neighborhoods through a network of producers and consumers who know through repeated experiences which houses grow which plants (Buchmann 2009). The social network formed through the trading of plants is used as a proxy for the equal distribution of other rare material resources and services, so the localization of the social-ecological system automatically generates strong social capital that is not seen in urban areas in many other countries (Buchmann 2009).

Most growers can source their plants to wild ancestor populations, and this information is passed on between producers and consumers, thus spreading local ecological

knowledge to a population that has little other interaction with local ecologies (Buchmann 2009). However, the rates at which wild plants are picked and transported into the urban areas is infrequent, which results in home garden horticulture as an unintentional but effective way to mitigate environmental impact on wild plant populations (Buchmann 2009).

Through the re-localization of plant growth and trade via home gardens (among other factors), a strong sense of community has been instilled within the Cuban neighborhoods (Buchmann 2009). Trust, communication, reciprocity and attachment to place are all indicators of resilient communities (Milestad *et al.* 2010), and the Cuban urban areas meet all of these indicators. What is yet undetermined, however, is the potential or need for the social-ecological system to scale up. The system itself is extremely self-sufficient and power is intentionally kept at a low level because of the low profile and extremely personal nature of the economic transactions. As the political situation slowly changes in Cuba, potentially coming under the influence of neoliberal pressures associated with international aid and trade opportunities, it may be that the nature of the system will flip into something entirely different, and even potentially risk a more violently enforced illegalization of informal bartering networks.

Conclusions

This study draws causal links between the re-localization of social-ecological food systems and community resilience. It is argued that horizontal and vertical linkages of scale create necessary networks that provide a medium for social learning, ultimately resulting in more resilient social-ecological systems. It is cautioned that extreme localization, perhaps better described as socio-economic isolation, is a misconstrued ideal rarely ever seen in history, as it has the potential to expose a system to high amounts of political, economic and environmental vulnerabilities. However, as is consistent with the food sovereignty movement, local communities must retain the agency to decide and craft their own scalar linkages based upon their unique historical and cultural contexts.

The strength and efficiency of social-ecological feedback loops are highly dependent on the intimacy and memory of a system, and so those communities that retain personal, face-to-face trade relationships with each other and strong cultural values tied to place increase their adaptive capacity to deal with external disturbances, as it is the local culture which is adaptive in the first place (Colombi 2012). In contrast, systems that are extremely disembedded from local process, feature high amounts of

inputs (mechanization, chemicals, genetically modified seeds), and craft policy which does not plug in to local feedback loops or cultural knowledge is extremely unstable and likely to flip into less productive, environmentally degraded, and culturally unvalued landscapes.

A consideration of the political ecology of social-ecological systems shows that the local scale should be the starting point of all policy decisions that affect the subsistence production and consumption of individuals within communities of all levels of social complexity. Rural hunter-gatherer populations and urbanites alike potentially have the cultural and social capital with which to understand their environments and manage their own natural resources. To restate Milestad *et al.*'s (2010) thesis: the re-localization of food is not the end in itself, but rather a means by which a community can build resilience, attain social justice, and maintain a meaningful cultural connection to the environment which sustains it.

Acknowledgements

I would like to thank Dr. Kathleen Galvin for the opportunity to write this piece, her enthusiastic encouragement, as well as instructing the Human-Environment Interactions course at Colorado State University that provided the theme for this research.

References

- Ayres, Jeffrey and Michael J. Bosia
2011 Beyond Global Summitry: Food Sovereignty as Localized Resistance to Globalization. *Globalizations* 8(1): 47-63.
- Buchmann, Christine
2009 Cuban Home Gardens and Their Role in Social-Ecological Resilience. *Human Ecology* 37: 705-721.
- Colombi, Benedict J.
2012 Salmon and the Adaptive Capacity of Nimiipuu (Nez Perce) Culture to Cope with Change. *American Indian Quarterly* 36(1): 75-97.
- Coughenour, Michael B.
2008 Causes and Consequences of Herbivore Movement in Landscape Ecosystems. In *Fragmentation in Semi-Arid and Arid Landscapes: Consequences for Human and Natural Systems*. (eds.) K.A. Galvin et al. The Netherlands: Springer. Pp. 45-91.
- Davidson-Hunt, Iain and Fikret Berkes*
2003 Learning as You Journey: Anishinaabe Perception of Social-Ecological Environments and Adaptive Learning. *Conservation Ecology* 8(1): 5. <http://www.consecol.org/vol8/iss1/art5>.
- Franklin, Alex and Julie Newton; Jesse C. McEntee
2011 Moving Beyond the Alternative: Sustainable Communities, Rural Resilience and the Mainstreaming of Local Food. *Local Environment* 16(8): 771-788.
- Galvin, Kathleen A.
2009 Transitions: Pastoralists Living with Change. *Annual Review of Anthropology* 38: 185-198.

Hajjar, Reem F. and Robert A. Kozak; John L. Innes*
2012 Is Decentralization Leading to "Real" Decision-Making Power for Forest-dependent Communities? Case Studies from Mexico and Brazil. *Ecology and Society* 17(1): 12. <http://www.ecologyandsociety.org/vol17/iss1/art12/>

Lackett, Jill M. and Kathleen A. Galvin
2008 From Fragmentation to Reaggregation of Rangelands in the Northern Great Plains, USA. In *Fragmentation in Semi-Arid and Arid Landscapes: Consequences for Human and Natural Systems*. (eds.) K.A. Galvin et al. The Netherlands: Springer. Pp. 113-134.

Matthews, Robin and Paul Selman
2006 Landscape as a Focus for Integrating Human and Environmental Processes. *Journal of Agricultural Economics*. 57(2): 199-212.

McCarthy, Daniel D. P. and Debbe D. Crandall; Graham S. Whitelaw; Zachariah General; Leonard J.S. Tsuji*
2011 A Critical Systems Approach to Social Learning: Building Adaptive Capacity in Social, Ecological, Epistemological (SEE) Systems. *Ecology and Society* 16(3): 18. <http://www.ecologyandsociety.org/vol16/iss3/art18/>

Milestad, Rebecka and Lotten Westberg; Ulrika Geber; Johanna Bjorklund*
2010 Enhancing Adaptive Capacity in Food Systems: Learning at Farmers' Markets in Sweden. *Ecology and Society* 15(3): 29. <http://www.ecologyandsociety.org/vol15/iss3/art29/>

Moore, Michele-Lee and Frances Westley*
2011 Surmountable Chasms: Networks and Social Innovation for Resilient Systems. *Ecology and Society* 16(1): 5. <http://www.ecologyandsociety.org/vol16/iss1/art5/>

Neuman, Roderick P.
2009 Political Ecology: Theorizing Scale. *Progress in Human Geography* 33(3): 398-406.
2010 Political Ecology II: Theorizing Region. *Progress in Human Geography* 34(3): 368-374.
2011 Political Ecology III: Theorizing Landscape. *Progress in Human Geography* 35(6): 843-850.

Ross, Anne and Kathleen Pickering
2002 The Politics of Reintegrating Australian Aboriginal and American Indian Indigenous Knowledge into Resource Management: The Dynamics of Resource Appropriation and Cultural Revival. *Human Ecology* 30(2): 187-214.

Watson, Alan and Roian Matt; Katie Knotek; Daniel R. Williams; Laurie Yung*
2011 Traditional Wisdom: Protecting Relationships with Wilderness as a Cultural Landscape. *Ecology and Society* 16(1): 36. <http://www.ecologyandsociety.org/vol16/iss1/art36/>

Zia, Asim and Paul Hirsch; Alexander Songorwa; David R. Mutekanga; Sheila O'Connor; Thomas McShane; Peter Brosius; Bryan Norton*
2011 Cross-Scale Value Trade-Offs in Managing Social-Ecological Systems: The Politics of Scale in Ruaha National Park, Tanzania. *Ecology and Society* 16(4): 7. <http://www.ecologyandsociety.org/vol16/iss4/art7/>