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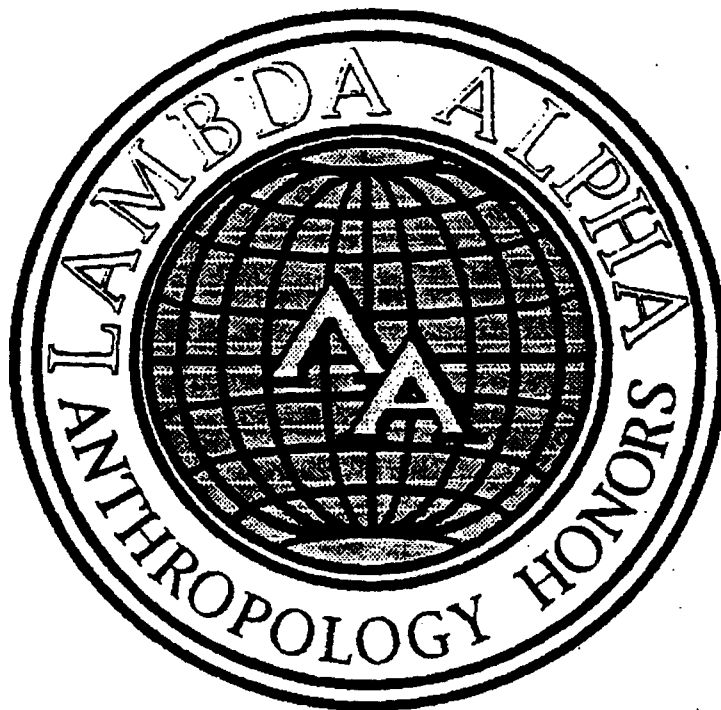
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PEER H. MOORE-JANSEN, EDITOR IN CHIEF

Lambda Alpha Journal

Volume 31, 2001

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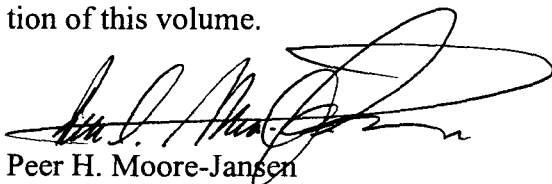
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LETTER FROM THE EDITOR

I am pleased to announce the completion of the thirty first volume of the Lambda Alpha Journal, a publication of the National Anthropology Honors Society. This year's volume presents six papers with topics in biological, archaeological and cultural anthropology. Volume 31 opens with an article by Janaki Meyappan addressing how African-American mothers of children with sickle cell disease react to the diagnosis and manage healthcare of their children. The next article is by Nishant Hasmukh Shah and discusses the role of cooperative breeding in different mammalian species and how it affects social behavior.

Immediately following, Miranda Callaway's article provides an index for distinguishing between *Canis latrans* and *Canis familiaris*, while Eric D. Peters gives us the results of his typological research on shell artifacts in southeast Florida. Asa H. Helm gives us a delightful comparison of Franz Boas and Bronislaw Malinowski, with a detailed account of their ethnographic work. The last article is by Shauna Ertolacci, and it addresses the political and economical influences on conservation in Ecuador.

This years journal concludes with an updated list of chapters and advisors, followed by a recognition of past award recipients of the National Scholarship Award competition and the National Dean's List Scholarship. The Journal staff welcomes all of the recent chapters and all new members to the society. We also want to congratulate this year's award winners and wish them success in their future endeavors. As a chapter sponsor and Journal Editor-In-Chief, I wish to extend my appreciation to all of the advisors and officers of the Lambda Alpha chapters across the nation. I would also like thank the student authors, and the student editor, Ms. Veronica Hinkle, for their contributions to the completion of this volume.



Peer H. Moore-Jansen
Editor-In-Chief

REDIFINING SICKLE CELL ANEMIA IN AFRICAN AMERICAN COMMUNITIES

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Sickle cell disease (SCD) affects 1 out of 600 African American individuals at birth. More than 50,000 African Americans have it today. It is a genetic disorder that affects an individual's hemoglobin and has deleterious effects on an individual's life (Steinberg 1999). Many studies have been done to see the medical effects of sickle cell anemia yet it is interesting to unpack the disease and its relevance within a particular population. The primary objective of this analysis is the study of African-American mothers of children with sickle cell disease and the ways in which they react to the diagnosis and manage healthcare of their children. The mothers in the study are the primary caregivers for their children and they are active participants, creators, and definers of the social world in which they live. The meanings they construct and assign to the sickle cell disease experience develop from their own values, resources and life experience and thus differ from the meanings medical experts assign to the disease.

Data Collection

The primary data for the research was collected in Hughes-Spalding Children's Hospital (a subset of Grady Memorial Hospital) and Egelston Children's Hospital, located in the metropolitan city of Atlanta Georgia, both which encompass a large population of African Americans. Hughes-Spalding Children's Hospital is located in downtown Atlanta and Egelston Children's hospital is in north-east Atlanta on the Emory University campus; thus both hospitals allow for a wide range of individuals in various classes to be comprised in the study. Both hospitals provide a broad range of medical care, primarily focusing on children under the age of twenty-one. I began my data collection by speaking socially to patients in the hospital, other key persons in the organizations that provide services for those with SCD, parents of SCD children and attending rounds made by hematology physicians at both hospitals. Interviews lasted anywhere from an hour to ten minutes and were based upon the willingness of the patients, parents, and healthcare providers to talk. The interviews were transcribed into a field notebook after the interviews had taken place. Great care was taken to protect the

confidentiality, feelings and the rights of the patients, doctors and parents involved. A few of the mother began to talk about sickle cell even before I could ask any questions. My approach was to be supportive and interactive and interested in listening. My research strategy drew upon the style of Berger and Luckmann, which viewed realities and meanings as socially created in an ongoing fashion by interacting individuals as they define and interpret events (Berger 1970). The approach was to understand the mother's definition of sickle cell anemia which places the diagnosis and management of the disease within their own cultural, racial, and class histories. I was specifically interested in learning about their knowledge and family history of the disease, their reaction to their child's diagnosis, the home care, the type of support, the type of medical care received, and finally the impact of the disease on the mothers and their families.

Sickle Cell Disease

Sickle cell disease was first found prevalent in African American populations in 1910 (Durham 1991). Sickle cell anemia is a type of sickle cell disease in which there is a single point mutation on the β -globin gene. This single substitution mutation for the sixth amino acid on the hemoglobin molecule results in HbS. HbSS, or sickle cell anemia is an autosomal recessive trait and is commonly found in people with African ancestry. The probability of genetically transferring the gene is mathematically easy to predict. It is estimated that one out of every twelve black people carry the trait and therefore have the potential to have a child with the disease. The disease is an other- health impairment disease, meaning that it affects not one area but multiple areas within the body. It consists of periodic and unpredictable episodes of pain due to vaso-occlusive crisis, serious infections, respiratory difficulties and stroke. Sickle cell disease can be diagnosed prenatally or at birth. Symptoms do not appear until the child is six month old (Eldelstein 1986, Relethford 1997). Researchers have only recently begun to examine the impact of the disease on children and their families. The objective of this narrow study is to focus on care giving and management in non-traditional (female-headed) African American households with children that have sickle cell anemia.

Nontraditional Families

The issues of race, gender, class and culture are crucial in the understanding of the organization of family. Racial exclusion, limited opportunities and poverty are common life experiences for many black families. High fertility rates, teenage pregnancy and single parent households often reflect Black families. Research rarely considers these types of situations. Traditional

healthcare studies have been performed in conjunction with traditional families, families that consist of two parents, namely a mother and a father, and their children; this is otherwise known as a nuclear family. Recent studies show that there has been a recent shift in the traditional family. Fewer than 25 percent of American families now conform to the nuclear model. The women in this study are more often than not multiple jeopardy families: they consist of families that face racism, sexism and classism. It is important to demonstrate how these families effectively and actively manage healthcare for their children.

Theoretical Perspectives

It is put forth that the mothers primary method of handling care giving tasks, alleviating stress, and coping with the reproductive implications of having a child with a hereditary chronic disease is to reject, redefine, or modify the medical model of sickle cell disease. The medical model of the disease focuses on the transmission of the disease with the specific statistical probability that the parents will pass the trait onto their child, the treatment and prognosis of the disease and the elimination of the disease by selective reproduction. The women involved in this study did not alter their reproductive behavior in part because of inadequate medical information. Some mothers were skeptics of the medical responses. In coping with the disease they redefined sickle cell disease. African American mothers of children with sickle cell constructed and responded to their own interpretations, creating an alternative perspective of reality. The medical model of the disease focuses on the disease as an essentially discrete, biological event as opposed to reality and a painful life experience. Thus there is a divergence in the medical and lay response to the disease. The lay response is dependent upon the context of the individuals.

The Black Families in a Historical Context

The African American women in this study are viewed in the larger historical context of the Black family, as well as socioeconomic factors that effect their values, lifestyles, and attitudes towards health and illness. Most of these mothers have some type of public assistance, welfare, or obtain Medicaid to help cover the costs of disease management. Many of the mothers come from single parent homes and live in predominantly black communities. Many of these mothers also have experienced poverty, homelessness and martial separation. The Black family has been a source of debate since analyst E. Franklin Frazier described Black families as undermined by the legacy of American slavery. Nontraditional Black families have their roots in historical experiences of Blacks in the

United States. Many African Americans came into bondage to provide for the growing agricultural economy of the United States by providing cheap labor. Undoubtedly, slavery has had a great effect on the lives of African Americans. Black families relative to white families have been deemed disorganized and inferior. Black women were and continue to be the target of blame for poverty, welfare dependence, and female-headed households. They are either the victims or the villains in the Black families.

Current Patterns of Motherhood in Black Families

Teenage motherhood and female-headed households have been the focus of many recent studies. Early motherhood was common among the mothers within this study. Previous learned patterns in behaviors such as having grown up in a home with a single mother, may explain early motherhood and the phenomena of female-headed households. It may also be a cause of the desire to have something to love, meaning teenage girls have children to serve as an object of their affection. The other most likely reason for teenage pregnancy is the feeling of immunity to the consequences of sex. These Black females are stereotyped as being strong, emasculated, independent and self-reliant, yet there are burdens that are placed upon these women in society. It has been stated that Black men feel resentment towards these black women because of their inability to become involved and provide economic resources for a family. This thus leads to the status of single parent households. Women also tend to rely on other female kin ties. The mothers in this study relied more on kin ties than their men who either no longer exist or who are not willing to help. One young woman responded that her daughter's father was not really involved and that he was never around enough to be involved. This seems to be the overwhelming state of affairs. Some mothers do not want to admit that the father has no role or involvement in her child's welfare. One woman said that her son's father provides food and clothing periodically. Some mothers' attitudes lay in another extreme and have resentment towards the fathers, which is in part due to economic hardship. One mother said that her child's father does not care about the circumstances of their child and therefore she did not care for him. Most mothers in the study tended not to rely on the father of their child. More often than not, another male figure will take on the responsibilities of the father; it is most usually a boyfriend, maternal uncle (avunculate) or a stepfather. One mother was living with her boyfriend with whom she had gotten into a fight. The boyfriend had then thrown her and her child out of the house; the mother and her child were living in her car when her daughter had suffered a severe vaso-occlusive pain crisis. At this time the mother took her daughter to the hospital where she began treatment. The mother and her child have yet to be

discharged from the hospital due to their current living situation. It is not uncommon to see even the boyfriend abandon the burden of taking care of a sick child and a mother. Another case, that was quite disheartening, was a teenager who had neither mother nor father and is taking care of himself. He is administering his own drugs and responsible for himself. He has no kin ties to support him unlike many of the single mothers in the study.

Relying on Female Kin

As previously stated, other men often fulfill the role of the biological father, yet mothers, in general, seem to turn to kinship ties to fill the void. The tradition of godmother and other mothers may be seen as a reflection of an Africanism, as seen from the Herskovitsian position. It may be an adaptation to cultural or racial oppression. Many of the mothers in the study relied heavily on female relatives or kin ties. Aunts and grandmothers were extensively involved in rearing children when their fathers were absent. One woman had disclosed that she, in fact, was not the child's mother but her aunt and that the biological mother had abandoned her child at birth. The biological father had died earlier of hemophilia and the child's brother had died of AIDS. This is a case of multiple jeopardy in which another female kin, in this case the aunt, takes on the role of mother. Another mother had said that while she was at work that the child's grandmother claimed responsibility as other. The child apparently seeks comfort only from her mother or her grandmother when she is sick, yet when she is in good health she seeks attention from her maternal aunt. In consequence the mother shapes her reality and her child's reality in order to better manage and cope with sickle cell anemia.

External Stress

Many mothers live with constant stress. They stress about the well-being of their child and about their economy and livelihood. Each mothers had different living conditions that placed stress on their current predicament. One mother was living in her car and was being supported by her boyfriend. As of now, she is living in the hospital until she is allowed back home. Another mother was dependent on welfare to aid her. Another woman was completely reliant on Medicaid for the expenses incurred at the hospital. Each hospital visit can prove to be fairly expensive. One adolescent female with sickle cell who had suffered a stroke at a young age was frequently at the hospital for chronic blood transfusions, a process that is expensive for anyone let alone a single mother. The cost of one child spending three days in the hospital had cost one woman over \$3,000. This same woman is working at a part-time job trying to support herself and her sick child. Stress and social positions influence response to daily life events. These women all

manage to cope with these events yet use agents of experience of hardship to restructure their family life.

Diagnosis of Sickle Cell

In 1970 there was a proliferation of public education and screening programs. The public education programs were initiated to increase awareness in the African American Community about the risk of sickle cell disease (Eldelstein 1986, Lewis 1970). This proved to not work as well as planned since women rarely consider SCD in their reproductive decision-making. This is yet another point that refutes the medical model. These screening programs and diagnoses provided limited information and not enough follow up care or continuity of health care services. One woman was not informed about routine follow-up appointments until her child had suffered a pain crisis. There is a discrepancy in the opinions of the diagnosis among the mothers and health care providers. The medical model of sickle cell disease sees SCD as a major health threat to Blacks, a serious disease that should be avoided if possible. These medical views focus on transmission of the disease with the specific statistical probability that the parents will pass the trait onto their child. It also focuses on the treatment and prognosis of the disease and the elimination of the disease by selective reproduction. Early detection is viewed as the key factor for control of the disease. Most mothers had never known a person with SCD before having their own child diagnosed with the disease. Furthermore, they do not seem to have a clear view on what it actually means to them or their children. In one situation, a mother had said that her child was not diagnosed with sickle cell until he was four months old and in the hospital with complications that arose from the disease. In spite of knowing about sickle cell, some mothers even knowing they are carriers of the trait only understood the repercussions of the disease after the child displayed unusual recurring symptoms. Some of the mothers were still not fully informed about the nature of the disease and some have trouble alerting doctors of the drugs and prescriptions their child is taking. A young mother had said that she was not fully explained the life threatening disease until she had learned about it through her own child's experience, who is now hospitalized with serious neurological disorders due to an episode of acute chest. One woman had struggled for a few minutes before she had given up and said that she could not remember what the name of her child's medication was. Not only dealing with diagnosis is important, but also reactions to diagnosis are important. Most women seemed very unaware of the effects of the disease so their reactions were mild. Some negative reactions were seen in biological mother who were aware of the sickle cell disease. A middle-aged mother had used the word "denial" to explain her feelings. Yet the same

woman still is strong and manages her child's health and well being by adjusting and reforming her reality.

Care Giving for Children with Sickle Cell

Aside from hospitals, most health care is provided at home for children with sickle cell. Many of these women rely on their child's specific behaviors, attitude changes and feeling to distinguish the amount of pain and the treatment for it. One woman had explained that she could tell when her son is having minor pain and having major crisis just by his behavior. These women base their knowledge of their child's disease on their child alone. When an average child gets a cold, it is fairly common, yet when a child with sickle cell gets a cold it may be very serious and life-threatening. One woman had said that when her child was younger she would be in and out of the hospital yet as the child has grown up she has learned from first hand experience how to care for her child. Mothers tended to keep a careful watch on their child during pain crisis and to take note of what caused the onset of a pain crisis in order to avert them the next time; it varies from child to child. Each mother seems to develop her own personal lay theory to the explanation of the onset of pain crisis. The biological mother or another mother figure usually administers medical care at home. This support is usually necessary with families that have a child with sickle cell.

Social Support

Outside of the kinship these mothers can find support in various places, although for some it is very difficult. It is suggested to the mothers that they find parent support groups or support through religion and through other friends. Some women even find support within the medical community and may even embrace the medical model. The latter situation is far less common. One woman is a Jehovah Witness could not turn to religion for her child's condition. Her child was a seven-year old boy who had suffered from an acute chest pain episode and was in desperate need of a blood transfusion. The mother's religion forbids blood exchange and therefore the boy had been taken custody by the state in order to save his life. She had said that it was very hard for her to reconcile her beliefs with her child's situation. She turns to friends that also have a young boy with sickle cell for support. Her family and her religion have proven to be of little help. Yet another woman says she turns to her church and her prayers to find sanctity. One very unique woman had decided, unlike most of the other mothers, to embrace the medical model and to supply her with the most amount of knowledge obtainable about sickle cell anemia.

Conclusion

The African American mothers in this study tend to reject, modify or redefine the medical model of sickle cell disease that emerged in 1970's with the screening programs. Their responses to the disease reflects neither ignorance nor passiveness but the realities of their own lives and circumstances. The medical model states that the sickle cell trait is dominant in the African American gene pool, can be transmitted genetically, and can be easily diagnosed. It also states that the disease can be eliminated through careful planning, genetic screening, and selective mating. The medical model assumes that people diagnosed as being carriers of the trait will alter their reproductive behavior. However, the medical model does not offer a viable and coherent strategy for managing the disease. The mothers in this study reject or socially construct their own reality of the SCD in a number of ways. Mothers seem to have little interest in delving into the medical knowledge, origin, and transmission of SCD. Instead these women focus on first-hand experience on how to cope with the disease. Finally, women in their social position place a high value on the ability to have children and on motherhood as a role. They use the resources available to them in order to manage their child's disease.

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COOPERATIVE BREEDING: AN INTEGRATIVE APPROACH

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In cooperative breeding, "members of the social group assist in rearing young that are not their own offspring (French and Solomon, 1997). The idea of cooperative breeding is anonymous with other phenomena like alloparenting and helping behavior. E.O. Wilson defined alloparenting as "An individual, other than the genetic parent, that provides care for a conspecific young (Riedman, 1982)." In addition, a helper is "An individual that performs parent-like behavior toward young that are not genetically its own offspring..." (Brown 1987). The terms cooperative breeding, alloparenting and helping will be used interchangeably throughout this paper. Helping behavior is a difficult social activity to justify because at first glance it appears to be truly altruistic. What could an individual gain from providing energy to rear offspring not directly related to it? This confusion is increased when looking at characteristics of cooperatively breeding societies. Cooperative Breeding includes three criterion: (1) delayed dispersal from the breeding group, (2) suppression of reproductive functions, (3) caring for another's offspring (Solomon and French 1997). What influences these characteristics and the potential costs and benefits of each unfold the development of cooperative breeding and its "adaptive" quality to the helping individual. The vast number of species incorporating aspects of cooperative breeding gives strong suggestion that there is some ecological development to the behavior. Observed behaviors are most represented in avian species, however, over 120 documented mammalian species have exhibited alloparenting (Riedman 1982). Mammals expressing cooperative breedings includes primates, canids, ungulates, and rodents. In addition, more mammals are split within groups, for example within primates, colobines express alloparenting and cercopithecines do not (McKenna, 1979). The diversity of species forces one to consider which ecological constraints or social environments would give rise to such "altruistic behavior?" There has been struggle with identifying what adaptive reasoning could be given for cooperative breeding. After, Hamilton's development of the inclusive fitness theory, it was clear that the ideas must be relevant to the apparent altruistic nature of cooperative

breeding. In his review of primate sociobiology, Gray (1985) finds seven possible adaptive explanations of alloparental behavior. These include the "mother relief" hypothesis, where the mother gains by increased foraging time while others care for her offspring. The "learning to mother" hypothesis suggests that the alloparent gains essential skills in how to parent. The "adoption" hypothesis identifies that the offspring's chances of adoption, if something happens to the parent, increases through alloparenting. A "group cohesion" hypothesis considers the developed social bonds as a result of helping behavior. The "selfish allomother" is a spiteful adaptation where the alloparent attempts to reduce the inclusive fitness of the helped mother and offspring. Finally, the "status elevation" hypothesis considers rank bonds formed through alloparental behavior. In addition to these hypotheses, considerations between what type of individual helps, i.e. males, females, young, breeders, or non-breeders, must be analyzed too. As one can see, who benefits, how much they benefit and in what way they benefit varies greatly. A further look identifies even more possibilities for the adaptive significance of cooperative breeding.

What are helping behaviors?

The issue of what are alloparental behavior is very speculative and until recently rarely defined for discussion. Behaviors which either assist in the survival of offspring or contribute to maternal energetics provides a basis from which to describe alloparental acts (Lee, 1989). In addition, Lee provides five subcategories to help clarify what is inclusive when describing cooperative or communal care of offspring. Protecting the young from predators is an important assistance helpers provide to maintain low infant mortality. The vulnerability of young makes this very important in societies where predatory behavior can greatly influence lifetime reproductive success (Goldizen, 1990). As young develop in a new ecological environment, certain environmental stressors can be dangerous. Assistance from alloparents against these stressors can be observed through cooperative denning and infant survivorship in extreme environments (Lee, 1989). The costs of parenting through the increased feeding required by mothers can be difficult to maintain while carrying young. Alloparents who take care of or carry young, allows time for the mother to seek out quality food sources (Terborgh and Goldizen 1985). Increased milk availability due to a larger number of lactating females, increases infant survivorship. This is seen through communal suckling which increases the amount of milk available per infant (Lee 1989). Finally, understanding learning patterns for young in socialized societies can be linked to the assistance provided by alloparents. Contact between young and other group members can increase social

learning and promote independence at an earlier age (Nishida, 1983). Children gaining independence earlier can allow the mother to return into estrus sooner and increase her overall reproductive success. In addition, juveniles with the opportunity to serve as alloparents can gain important knowledge and skills associated with child care. Nishida (1983) provides an interesting look at types of interactions between infants and their alloparents. Most often, older siblings serve as helpers for infants, however, Nishida also observed helping behavior from non-related immigrant females. Nishida observed four types of alloparental behaviors among the chimpanzees: invitation and enticement, detachment from mother, care and tickling, rough-and-tumble. All but the last category allowed the mother abilities to roam independent of the child. The benefits of these behaviors will be examined at the end of the paper. Elephants exhibit a very different type of alloparenting behavior. Alloparents can provide energetic benefits to the mother, elephant helpers usually provide protection and group solidarity. Infants will almost always feed from the mother and in most cases alloparents will not allow an infant to feed from them (Lee, 1987). However, the close relationship between the mothers, influences protective and learning among elephants. Young who roam too far from the group, get stuck in a hole, or make danger cries, will often be tended to by alloparents. Suckling will occur as a comforting measure. Other behaviors common between alloparents and juveniles is rubbing and greeting, mostly ways to maintain social bonds between the group members (Lee, 1987).

Ecological Constraints

A look at most cooperative breeders finds them in warm, temperate, subtropical or tropical areas (Emlen, 1982a). Within stable and predictable environments, this image became the standard ecological definition for cooperative breeding species. However, many species began to be discovered in very unpredictable environments, especially among birds in Australia (Brown, 1987). These diverse environments split scientists into two schools (Emlen, 1982a). The k-selection school believed that high investment of resources among a few offspring was the most influential factor on cooperative breeding. This would have required a stable environment where resources were readily available, however, competition was high. The variable environment school believed that variable environments with unpredictable ecologies influenced cooperative breeding. In such circumstances, extra help would be essential to maintaining populations during harsh seasons (Emlen, 1982a). How does one explain such diverse environments developing similar social and strategies? A closer look at two of the characteristics of cooperatively breeding societies, delayed dispersal and de-

layed breeding, provide explanations for the ecological and social factors which encourage cooperative breeding. Dispersal is the "process of permanently leaving the natal territory" (Koenig et al, 1992). In most species, an individual will leave the natal group when it is able to move to a new territory and establish itself as an individual breeder. It is important to note that in most species, two breeding individuals serve as the most successful reproductive pair, where cooperative breeders are the exception (Emlen, 1982a). Delayed dispersal involves juveniles staying in their natal group past the age of dependent feeding. This can be up to one or two years past weaning (Brown, 1987). Delayed dispersal and helping behavior are usually co-occurring. For most mammals, there are two choices: to disperse and breed independently or to not disperse and help in their natal group. Many different factors influence whether an individual will disperse or stay. Factors include, the cost or risk of dispersal, the probability of establishing and finding a suitable territory, the probability of finding a mate, and the likelihood of reproducing successfully after having established oneself (Emlen, 1982a). Ecological variables influence all of the above factors. The costs of dispersal include food and shelter. Also, there is the risk of predation. The group territory is usually an area of high resource yield. Food resources and shelter areas have been well established. An individual who wishes to leave the group will be independent on finding food resources. In addition, groups usually have developed strategies to deal with predators. Alone, an individual is not able to adequately defend himself, especially if the individual is young and does not have experience defending its territory (Emlen, 1982a; Koenig et al, 1992). In areas of high competition, establishing and defending a suitable territory could be difficult for a potential breeder. Also, competition for mates can present added difficulties. The level of competition for unestablished territories and mates, influenced by the population density and rates at which territories are abandoned, vary and influence how likely or unlikely a species is to disperse (Koenig et al, 1992). Finally, the likelihood of successfully reproducing after finding ones own territory and mate, is influenced by the "degree of difficulty in raising young" (Emlen 1982a). For different species and environments, the degree of difficulty varies. The measurable fitness of an individual trying to breed on its own is a combination of its ability to establish a territory with mate and its likelihood of successfully raising offspring (Emlen, 1982a). The original hypothesis to explain ecological influences only focused on the "habitat saturation" hypothesis (Koenig et al, 1992). It suggested that the inability for the lone individual to effectively compete to gain access to territory and mates most influenced its decision to stay with its natal group. A competing hypothesis was the "benefits of philopatry" reasoning (Koenig et al, 1992). It suggested

that the benefits of staying, such as efficient foraging and protection from predation, most influenced the decision to stay. Neither one effectively explains cooperative breeding and delayed dispersal in the diverse ecological areas mentioned at the beginning of this section. For in variable environment, there may be available territory and mates, however the risks of leaving the group may not be great enough to encourage the behavior (Koenig et al, 1992). Koenig et al (1992) suggest a more inclusive theory, the delayed dispersal threshold model. Its parameters are set by five limiting factors: (1) relative population density, (2) fitness differential between dispersal and breeding vs. delayed dispersal and helping, (3) fitness of floaters (breeding individuals with no territory. most often found in birds), (4) distribution of territory quality, and (5) spatiotemporal environmental variability. This theory integrates the "habitat saturation" model and the "benefits of philopatry" hypothesis, and says that no factor is ultimately determining. In certain types of comparisons between similar groups, a single factor may predict the differences, however, all the parameters must be taken into account before an evaluation of delayed dispersal is made. Delayed dispersal is claimed to be a cause of group living in cooperative breeders (Mumme, 1997). This close relationship between group living and cooperative breeding emphasizes the evolution and maintenance of delayed dispersal. The importance of group living for cooperative breeders, makes delayed dispersal also an essential aspect of any helping society. Delayed breeding is a difficult behavior to grasp. The possible sources and influences can vary greatly. However, it has been observed in almost all cooperative breeding species. Delayed breeding appears to be very costly in terms of overall reproductive fitness of the individual (French, 1997). It is an important concept, because an individual is either limiting its ability to breed or is forcibly being prevented from breeding for the purpose of helping in its natal group. Reproductive suppression is closely linked with dispersal (Brown, 1987). Delayed dispersing groups and reproductive suppression co-occur, obviously for the reason that an individual leaves its natal group for the sole purpose of breeding. Delayed dispersal and group living can result in mating conflicts and social difficulties. Important results of suppressed reproduction include incest prevention and reduced intergroup conflict (French, 1997). Understanding how suppressed reproduction is achieved is much more difficult. There is evidence suggesting both endocrinological and behavioral influence. A look at both of these options helps evaluate which ecological constraints lead to suppressed reproduction. Cooperative breeders exhibit group breeding along a continuum from singular to plural breeding (Mumme, 1997). Singular breeders maintain one breeding pair and plural breeders have more than one pair of breeders. In singular breeding societies,

alloparents are most likely non-breeding. Plural breeders must depend on breeding alloparents. Most mammals are singular breeders and this presents a problematic situation. Mammals such as primates, have very low overall reproductive rates. Investment into individual births rather than litter births have developed over time. It would seem very detrimental to an individual of breeding capabilities to stay in the natal group and not breed. Because of this inconsistency, it is important to understand how suppressed or delayed breeding is maintained among mammals in cooperative breeding societies. Reproductive suppression is "the failure of some individuals within a social group to reproduce" (Mumme 1997). Reproductive suppression suggests that either some social or ecological factor must be limiting the individuals ability to participate in reproduction or some endocrinological or physiological limitation must be induced upon the individual. It is difficult to divide these two types of limitations into a dichotomy. Differences of suppression exist between separately ranked individuals and between the sexes. Male suppression is more commonly regulated through behavioral mechanisms, while female suppression is more commonly a mixture of both endocrinological and behavioral mechanisms (Mumme, 1997). The gray wolf, examined by Asa (1997), provides an example of behavioral suppression within group members. Especially among males, it can be found that the alpha male will intercede on subordinates attempting to copulate. If the males dominance is well established, his presence or staring can prevent reproductive behavior in subordinates, however, fighting is likely to ensue. In the gray wolf, all suppression among males and females is entirely behavioral. Male testosterone levels, testis size, and semen production is equivalent across ranks. Among females no difference is observed in estrogen, progesterone or luteinizing hormone. Because reproductive suppression is monitored by an individuals parents, it can be hypothesized that such suppression helps to prevent incest relationships. The alpha male breeder assumes the position of having fathered most of the children. Young males mating with other females will most likely be mating with close relatives, therefore reproductive suppression among the gray wolf allows close, small, genetically related groups remain together without the fear of incest. This also helps maintain a level of inclusive fitness in helping. Staying in close genetically related groups gives genetic justification to helping behavior. Primates are well studied for their reproductive suppression. Primates are extremely important to study because of their k-selection, as mentioned above, animals which give rise to few offspring, and heavily invest resources into those offspring. There are different levels of reproductive suppression. It is important to look at these different times where reproduction can be suppressed to identify their social

significance. Table 1 lists many of the different strategies of suppression (French, 1997). An examination of Callitrichid primates, including marmosets and tamarins, summarizes some of the behaviors found in Table 1. Among callitrichids, delayed breeding among subordinates is very common. French (1997) found that among callitrichids, delays in puberty served as a physiological mechanism delaying breeding. There is much evidence for the social control of such delays. It has been found that cotton-top tamarin females housed away from the natal group entered ovulation much earlier than females housed with the native group (Tardif in French, 1997). However, isolation was not enough to return females to normal ovulation patterns. Only when housed in isolation with unfamiliar males, did females regain normal ovulatory patterns. It appears that female delayed puberty is under social constraints depending on a females rank, and the males around her (French, 1997). These restraints help maintain cooperative breeding and prevent incest and conflict over mating. In the common marmoset, ovulatory suppression has been observed to be regulated by olfactory cues. It is important to note that the individual cues must come from the females natal dominant female (Barret et al., 1993). Such a method is important in understanding the development of singular breeding. A dominant female would have to be able to limit the breeding ability of other females (French, 1997). Postconception methods of suppression are not nearly as common as preconception. Examples of stress or aggression induced abortions are very rare but can have impacts on the overall fitness of the individual. These may serve as mechanisms to prevent females from attempting to breed rather than ways of maintaining cooperative breeding (French, 1997). Targeted aggression is the most common type of behavioral preconception mechanism among callitrichids. Targeted aggression can be more abusive between females than males, however, the number of aggressive encounters between males and between females are observed to be equal. Aggression is also used as a tactic in preventing unrelated females from entering the social group. This behavior may help maintain singular breeding by keeping the natal group closely related and increasing inclusive benefits to staying and helping (French, 1997). Finally, behavioral mechanisms of postconception suppression are an unlikely method for maintaining singular breeding. Behaviors such as infanticide are not observed among wild callitrichids and thus are not considered to be effective methods by dominant individuals to maintain breeding status among groups (French, 1997). Again, it is important to emphasize that cooperative breeding societies exist among a continuum of singular to plural breeders. No society is strictly singular or plural, often times exceptions are found within these societies. It is a careful balance defining how singular breeding is maintained. Many of

the factors described above contribute to that maintenance, but a complete understanding of such behaviors is dependent on more conclusive studies of delayed breeding patterns in mammals. Defining ecological factors which may contribute to delayed breeding is difficult. Some relationships can be inferred to delayed dispersal, for often times, delayed breeding and delayed dispersal co-exist. However, it would be important to conduct field studies examining habitat quality and suppressive mechanisms (French, 1997).

The previous discussions have worked to emphasize the social and ecological influences that help establish cooperative breeding among certain societies. Small groups of closely related individuals provide inclusive benefits for cooperative breeding. Measuring fitness between the options to stay in one's natal group and help versus dispersing to breed establishes the criterion for cooperative breeding. Mechanisms for delayed breeding serve to maintain cooperative breedings by keeping individuals within their natal group. It is important to note that cooperative breeding is the exception to the rule. It is more common to find species leaving their natal group to establish their own territories, but this just emphasizes the importance of looking at both ecological and social conditions which maintain cooperative breeding.

Adaptive Significance

The introduction provides a brief summary of possible adaptive strategies for cooperative breeding. An important question to ask is "who is benefiting?" There are three main players in cooperative breeders, the helper, the mother, and the infant. How does each one gain in relation to the behaviors? A look at each individual will help explain exactly where the advantages of helping can be identified. The infant has much to gain, being the object of help. Protection from predators, protection from environmental stresses, adoptive advantages, social learning, and nutritional gains are the main benefits for infants involved in cooperative breeding. Protection from predators is an important benefit. An underlying theme for benefits of all individuals is infant survival. As seen, for reasons of reproductive success and inclusive fitness, protecting infants is an important part of helping. In chimpanzees, protection by family when the mother is not near the infant is common (Nishida, 1983). Along the same lines, elephants have been observed helping young walk and bringing young back to the group if it happens to wander too far. Elephant societies are made up of mostly related females. If the mother is absent, another female will look after the infant and make sure it does not jeopardize itself (Lee 1987). In certain circumstances, an infant's mother may be killed. In these instances, helpers provide possible adoptive individuals. Adoption of orphaned infants by helpers has been observed in the common

langur after the infants mother was killed by dogs (McKenna, 1979). This data supports the "adoption" hypothesis proposed by Gray (1985), referred to in the introduction. Growing up in a group provides important opportunities for social learning. Interaction with more adults and other group members teaches the infant about social behavior and group dynamics.

In chimpanzees, a helper was seen preventing a child from eating a food which was not part of their diet. Therefore, through the helpers the infant learned which foods were edible and which foods were not (Nishida, 1983). Advanced social learning can help a child become independent more quickly, giving it reproductive advantages. Finally, the infant may achieve nutritional gains through alloparenting. Communal suckling is one form of increased milk available for infants. Goldizen observed adult helpers providing food to infants in saddle-backed tamarins. Often times infants would steal food long past their dependence on helpers and their mother (1987). The potential benefits for infants are clear. It is important to note that many times alloparenting can have ill effects on infants. Other breeding mothers have been observed abusing unrelated infants. This can in extreme cases result in the death of the infant. Infants have no energetic consequences with alloparenting, therefore any helpful behavior is entirely beneficial for the infant. As a result, it is difficult to justify the evolution of helping behavior through the benefits of infants. The mother is an important player in analyzing costs and benefits of cooperative breeding. Gray (1985) mentions the "mother relief" hypothesis as a possible adaptive explanation for alloparental behavior. This is probably the most common cited benefit for mothers. Extra feeding time and leisure time is important for mothers in many ways. The cost of increased nutrition when a mother has dependent young is expressed through the infants nutritional needs, requirements to maintain lactation, and energy requirements for foraging for high quality foods can be increased if an infant must be looked after or carried at the same time. (Lee 1989). Among elephant societies, the mother is the key provider of milk. Rarely will other females allow young to feed from them. Therefore it is important that the mother meet nutritional requirements to maintain lactation (Lee 1987). Possibly the most important selective factor comes if the mothers inter-birth interval can be reduced to increase her lifetime reproductive fitness (Lee 1989). Helpers maintain growth levels while the mother does not have to exert as much energy. As a result, the mother can energetically recover faster and return to estrous or reproductive capability sooner. Describing the adaptive benefits for the helper takes a step towards the more complicated. Who is the helper is the first question to be asked. The helper can vary from nulliparous (non breeding) females, to parous (breeding) females, to males. Each has a different adaptive reason to partici-

pate in cooperative breeding, all in attempts to increase their lifetime reproductive success. In most cases, helping females will be nulliparous. The energetic requirements for breeding females to take care of their own young, in addition to helping other infants is rare. The exception lies in species that have very crowded breeding groups and allow communal raising, such as in seals. Referring again to Gray's list of adaptive hypotheses, nulliparous females serve to gain through "learning to mother" and the "status elevation" hypothesis (1985). Gaining experience in mothering is an important result of allomothering. The allomother is allowed to carry, raise, and play with the offspring. Through this interaction, allomothers learn efficient methods for raising young. Among chimpanzees, Nishida noticed that parous females, would rarely contact or interact with infants. On the otherhand nulliparous females could gain important maternal experience through handling the infants, experience already possessed by the parous females (1983). Goldizen noticed that in wild callitrichids, mothers were better at rearing their own young if they had had experience carrying when they were younger (1990). Riedman points out that learning to mother can be extremely important among k-selected individuals. Parent quality would be important in such species, therefore, anything to enhance future parenting behavior would be beneficial to lifetime reproductive success (Riedman, 1982). There are some exceptions to the learning to mother hypothesis. Among vervet monkeys, older, experienced, adult mothers are often the ones seen allomothering. Their involvement in allomothering would have to be for some reason other than maternal experience. From a selective point of view, learning to mother could be an important characteristic. Societies where such a behavior was present, could reach greater future reproductive successes. Experience would allow young females to enhance their long-term reproductive fitness (Terborgh and Goldizen, 1985). "Status elevation" can be a strong benefit for allomothering. In wild callitrichids, the death of the dominant, breeding female, will result in a helper inheriting that position. In addition, the individual inherits potential helpers through offspring she had helped rear (Goldizen, 1990). Status elevation does not require inheriting a breeding position. Bond formation and coalition forming against the dominant female can be a possible result of helping, too. Status elevation is difficult to address evolutionarily. Because cooperative breeders live in environments with highly competitive breeding schemes, staying at home waiting to inherit one's natal territory can serve as the most successful method of reproduction. However, it is difficult to judge and the quantitative evidence does not exist. Adult, parous, females have much less to gain through helping. However, Emlen proposes an entirely different hypothesis which may have contributed to the selection for alloparenting behavior. He analyzed the role of group

conflict and looks at the role of the breeding helper. Emlen came to the conclusion that because the helper has much to gain from group living (at least in environments which have extreme constraints to breeding independently), the helping breeder will try to minimize the possibility of being expelled from the group through helping (1982b). Individuals could be selected for such a characteristic and abilities to avoid group conflict. A spiteful mechanism is referred to by Gray as the "selfish allomother" hypothesis. Nishida's observations with chimpanzees, provide a case in point. Abuse toward young was common from parous females. This included pushing and pulling young out of trees and shrubs, or striking another infant with her knuckles. This sort of abusive relationship has never been observed to produce serious physical injury, however, the existence of "abuse" is still present. Finally, the helping male as a beneficiary to alloparenting. The most important involvement of male help is in the polyandrous behaviors observed among tamarins. Usually in trios, two males will assist one female. Each male will copulate with the female, and after giving birth, both males will remain to help. For a female, carrying offspring can be extremely energy consuming. Having a helper, especially male, can greatly increase the mother's ability to forage and feed effectively. However, it is unlikely that one male will assume this responsibility because of the individual costs to his fitness, two males can share the roles of carrying and foraging effectively, preventing any major compromises in fitness (Terborgh and Goldizen, 1985). This system is probably a compromise for males to mutually enhance their reproductive success (Goldizen, 1990). Especially among callitrichids, where twinning is common, females could rarely raise the offspring without help. Two male helpers can successfully raise more offspring than a single male mate (Goldizen, 1990). Maintaining anonymous paternity by the female maintains that both males who have equal mating opportunities will maintain helping strategies. Among callitrichids, ovulation and physical sign of estrus are concealed so that males are unable to detect when the female is ovulating. It is not known if other indicators exist, but concealed ovulation may have been an important strategy in maintaining the polyandrous trio (Goldizen, 1987). There is one final set of benefits which may be incurred through cooperative breeding. Group benefits serve to help all of the individuals in a society. Among cooperative breeders, group living is observed to be a result of delayed dispersal (Mumme, 1997). This close relationship between delayed dispersal and the benefits of group breeding serve as an important advantage for group living cooperative breeders. All the advantages of group living, increased foraging efficiency, protection from predators, etc., will serve as benefits for cooperative breeders. Gray also suggests the "group cohesion" hypothesis, that the construction of social bonds through helping

maintains the structure of the group.

Fitness and Natural Selection

A genetic link to group and individuals must be established to evaluate whether there is an selective advantage of cooperative breeders. A look at total fitness through its four components; current direct fitness, current indirect fitness, future direct fitness, and future indirect fitness; provides reasoning for the selective advantages of cooperative breeding (Lucas et al, 1997). Current direct fitness can be measured as the number of offspring an individual can have. For the breeder, cooperative breeding is definitely advantageous. As seen in elephants and callitrichids, help provided to the individual increases infant survivorship and the direct fitness of the breeder. Current direct fitness does not benefit the helper because more often than not, the helper has non-breeding status. Future direct fitness is evaluated by the individuals lifetime reproductive success. This would be overall survivorship of young and increased fecundity over a lifetime for helpers (Lucas et al, 1997). Benefits inclusive of future direct fitness are parental experience for helpers and inheritance of breeding positions and potential alloparents (Mumme, 1997). All of these factors promote survivorship and the lifetime reproductive success of an individual. Indirect fitness gains may be the most important influence on cooperative breeding. Mumme cites seven extensive studies on the indirect fitness gains of alloparental behavior and five of the seven presented significant evidence for benefits of reproduction. More and more evidence is also being presented that alloparental care is preferentially directed towards kin versus non-kin (1997). The effect of helpers on breeders is a decrease in energetic costs for the breeders. The decrease in work increases the survivorship and future reproduction of those who are helped. As most cooperative breeding societies consist of closely related individuals, most benefits of helping will be toward kin and therefore increase the future indirect fitness of the helper. In the end, most of the energetic and reproductive benefits of cooperative breeding is speculative. Much more research concerning the measured individuals benefits must be conducted if final answers concerning the evolution of cooperative breeding is to be assessed (Lucas et al, 1997).

Conclusion

This paper has tried to objectively study cooperative breeding among various mammalian species. Though the data concerning mammals is more limited than that of avian societies, it is clear that many mammalian societies have strong expressions of cooperative breeding. It is important to return to the original question. "Are primates really unique?" The existence of cooperative

breeding across extremely diverse taxa tends one to answer "no". On the other hand, primate groups like the tamarins and marmosets exemplify very complex methods of breeding. Examples such as concealed ovulation which also exist in humans calls into question our understanding of the ability of primate groups to maintain cooperative breeding. It may be that primates are able to integrate and conform their social behavior to maintain cooperative breeding, while other species are more susceptible to ecological constraints. The evidence does not exist to say that primates are particularly "unique" when studying cooperative breeding. On the other hand, primates express a high level of variability among behavioral patterns, and added benefits and costs related to cooperative breeding. This suggests that primates may have further integrated cooperative breeding as more than just a social reproductive mechanism. Until an integrative approach is taken with cooperative breeding, studying breeding against both social hierarchy and group dynamics, it is impossible to speculate on the inherent attributes of our fellow relatives—the primates.

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A POSSIBLE INDEX TO DISTINGUISH BETWEEN CANIS LATRANS AND CANIS FAMILIARIS

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The crania of *Canis latrans* (coyote) and *Canis familiaris* (dog) are morphologically similar and can be confusing when trying to differentiate between the two. Dogs and coyotes have similar origins that go back into the Oligocene. The *hespaeocyon* is the extinct creature that gave rise to all canids (Colbert 1958:68). Hence, many canid skulls look very similar in structure. There is a definite distinction between dogs and other canids. In compared patterns of intracranial allometry and morphological diversity between domestic dog and wild canid species, domestic dogs were shown to be morphologically distinct from all others except wolf like canids (Wayne 1985:247). Dogs having a similarity to wolf like canids can be explained by the theory that dogs are descended from wolves. Some of the morphological changes that occurred in the domestication are size reduction, shortening of facial region, and paedomorphism (retention of juvenile characteristics) (Morey 1992:182). Coyotes evolved separately from wolves and dogs.

Coyotes are more related to foxes than wolves and have a more generalized biology than the other canid counterparts. They have narrower skulls than wolves and the jaws have not developed as wide as the wolves, which, in the case of dogs compromises gripping power (Nowak 1978:5). In his paper "Distinction between the skulls of coyotes and dogs," Krantz (1959) gives an excellent description of gross morphological differences between dogs and coyotes. The Coyote has the following characteristics -- A longer narrower muzzle, small frontal sinus, s-shaped zygo-maxillary suture, a vertical posterior border of coronoid process, a plane of palate that would miss skull if extended, the space between the auditory bulla is narrower than either bulla, internal nares are in line or slightly forward of second molars, the anterior palatine foramen is three or four times long as it is wide, the lower first molar rear cusp is the same size as the other two, the second, third, and fourth premolars are three times long as they are wide, and the coyote has a straight tooth row. The dog has a shorter wider snout, tooth row that bends outward, often has teeth missing, pronounced bulge over occipital orbits, straight zygo-maxillary suture, the posterior coronoid process extends backwards at the tip, the plane of the palate would hit the skull, the space

between the auditory bulla are wider than the bulla, internal nare usually extend to a point behind second molars, anterior palatine foramen two times as long as it is wide, lower first molar rear cusps differ in size, and the second, third, and fourth premolars are three times long as they are wide. Craniometric differences exist as well. If the molar tooth row is 3.1 or more times that of a palatal width, the specimen is a coyote. If the molar tooth row is 2.7 times or less, the specimen is a dog. (Howard 1949:170)

Despite all these differences confusion may still arise when differentiating between the two species, especially if the cranium is incomplete, or if the characteristics look like they could belong to dog or coyote. More craniometric evaluations may be utilized to establish mathematical guidelines for distinguishing the two species and the evolutionary processes. Additional indexes would be helpful in defining the correct species and establishing evolutionary relationships.

Method and Materials:

Ten cranial measurements from several regions of the cranium were established using guidelines from "A Guide to the Measurement of Animal Bones from Archaeological Sites." (Dresch 1976:42-45). The measurements were viscerocranium length (nasion to prosthion), facial length (midpoint-prosthion), greatest length of nasals (nasion-rhinon), least breadth between orbits (entorbitale to entorbitale), upper neurocranium length (akrokranium to frontal midpoint), total length (akrokranium to prosthion), medial palatal length (stephylon to prosthion), breadth at canine alveoli, and greatest mastoid breadth (greatest breadth of the occipital triangle otron to otron). Both modern and archaeological specimens were measured. These measurements were taken in the biological anthropology laboratory at Wichita State University using sliding and spreading calipers. These numbers were then entered into a Microsoft Excel Database for ease in analyzing. Averages for each measurement in the two separate species was computed as well as the following indices: breadth of canine alveoli over greatest mastoid breadth, greatest mastoid breadth over breadth of canine alveoli, least breadth between orbit over greatest mastoid breadth, greater mastoid breadth over least breadth between orbits, facial length over total length, total length over facial length, median palatal length over total length, total length over median palatal length, median palatal length over breadth at canine alveoli, and breadth at canine alveoli over median palatal length.

Results and Discussion:

The averages for the species all came out to be very similar. This is not surprising considering the measurements were very similar with overlap be-

tween the two species (Table 1). Many of the indices came out very similar as well. Medial palatal width over breadth at canine alveoli was the only index that showed any significant difference. With one exception, all dogs were below three, and all coyotes were above three (Table 2). The one exception was M00024, whose average was 2.967742. It should be noted that this particular specimen was reconstructed. Medial palatal width over breadth at canine alveoli is a possible index with significant difference between the two species. If this is true, this index could be compared with other wild canid species such as foxes and wolves in order to establish clearer evolutionary relationships. More specimens need to be measured and evaluated in order to establish the accuracy of this particular index.

Table 1: Averages for all measurements

species	catalog #	MISCERO	FL	GLN	LBBO	UNL	TL	MPL	BACA	GMB	HOT
familiaris	MJZ-003	10.1	14.4	7.6	8.1	9.1	20.8	10.5	4.9	8.1	4.8
familiaris	MJZ-139	8.4	9.7	6.4	4.2	7.5	16	7.3	2.8	5.1	3
familiaris	MJZ-066	NA	NA	NA	5.5	NA	NA	NA	NA	6.2	4
familiaris	MJZ-020	10	11.9	7.6	5.5	9.3	19.5	9.4	3.7	6.4	4.1
familiaris	M0060	12.1	15.1	8.4	5.8	9.8	20.9	10.6	3.9	7.2	4.5
average		10.15	12.775	7.5	5.82	8.925	19.3	9.45	3.825	6.6	4.08
latrans	MJZ-015	9.3	10.9	7	5.1	9	18.9	9.5	2.9	5.9	3.7
latrans	MJZ-067	10.8	12.6	8.3	5.1	9.4	20.6	10.2	3.4	6.6	4.1
latrans	MJZ-060	10.2	12.2	7.8	5.5	9.4	20.6	9.8	3.2	6.1	3.4
latrans	MJZ-122	9.2	10.6	7.6	4.6	8.9	18.8	9.2	3	6.1	3.4
latrans	MJZ-038	8.9	10.8	8.7	4.4	8.6	18.4	9.2	2.9	5.7	3.3
latrans	MJZ-028	8.7	10.8	7.4	4.4	8.8	18.6	9	3	6	3.1
latrans	M00023	11.8	13.3	8.4	4	9.1	19.6	9.1	2.9	4.8	3.1
latrans	M00024	10.6	13	7.5	4.4	8.8	18.5	9.2	3.1	5.6	3.9
latrans	M0102	10.2	12.5	6.5	3.9	8.8	18.4	9.2	2.9	5.9	3.4
latrans	M00008	11.5	13.9	7.8	4.6	9.1	19.8	9.8	2.9	5.8	3.8
average		10.12	12.06	7.7	4.6	8.99	19.22	9.42	3.02	5.85	3.52

Table 2: Indices

specimen	LBBO/BACA	BACA/LBBO	GMB/BACA	BACA/GMB	GMB/LBBO	LBBO/GMB	FL/TL	TL/FL	MPL/TL	TL/MPL	MPL/BACA	BACA/MPL
familiaris MJZ-003	1.653061224	0.604938272	1.653061224	0.604938272	1	1	0.699029	1.430556	0.504808	1.980952	2.142857	0.466667
familiaris MJZ-139	1.5	0.666666667	1.821428571	0.549019608	1.2142857	0.82352941	0.60525	1.649485	0.45625	2.191781	2.687143	0.363662
familiaris MJZ-020	1.486486486	0.672727273	1.72972973	0.578125	1.1636364	0.853975	0.610256	1.638655	0.482051	2.074468	2.540541	0.402174
familiaris MJZ-066	N/A	N/A	N/A	N/A	1.1818182	0.84615385	N/A	N/A	N/A	N/A	N/A	N/A
familiaris M0060	1.487179487	0.672413793	1.846153846	0.541666667	1.2413793	0.80555556	0.722488	1.384106	0.507177	1.971699	2.177949	0.357925
AVERAGE	1.5316818	0.654186501	1.762993343	0.568437387	1.1682238	0.86692276	0.699506	1.5257	0.487572	2.054725	2.520889	0.405882
latrans mjz-028	1.466666667	0.681818182	2	0.5	1.3636364	0.73333333	0.580645	1.771429	0.483871	2.066667	3	0.333333
latrans mjz-015	1.795633333	0.558627451	2.034482759	0.491525424	1.1568627	0.86440678	0.57672	1.733945	0.502646	1.999474	3.275862	0.305263
latrans mjz-067	1.5	0.666666667	1.941176471	0.515151515	1.2941176	0.77272727	0.61165	1.634921	0.496146	2.019608	3	0.333333
latrans mjz-122	1.533333333	0.652173913	2.033333333	0.491803279	1.326087	0.76666667	0.56383	1.773685	0.489362	2.043478	3.066667	0.326087
latrans mjz-038	1.517241379	0.658090909	1.965617241	0.50377193	1.2954545	0.77192882	0.588857	1.703704	0.5	2	3.172414	0.315217
latrans m00023	1.379310345	0.725	1.665172414	0.604166667	1.2	0.83333333	0.678571	1.473684	0.464286	2.153846	3.137931	0.318681
latrans m00025	1.464285714	0.682926829	2	0.5	1.3698537	0.73214286	0.717391	1.353939	0.483696	2.057416	3.178571	0.314827
latrans m00024	1.419354839	0.704545455	1.806451613	0.553671429	1.2727273	0.78571429	0.702703	1.423077	0.497291	2.01087	2.967742	0.338957
latrans m0102	1.344827586	0.743689744	2.034482759	0.491525424	1.5128205	0.66701695	0.679348	1.472	0.5	2	3.172414	0.315217
latrans mjz-060	1.71875	0.581818182	2	0.519625	1.1636364	0.8593975	0.592233	1.688625	0.475729	2.102041	3.0625	0.328631
latrans m00008	1.596206897	0.630434783	2	0.5	1.2608696	0.7115	0.70202	1.42446	0.5	2.020408	3.37931	0.295918
AVERAGE	1.51745223	0.663335647	1.951874225	0.515649151	1.252086	0.71778803	0.635643	1.590297	0.498186	2.0433073	3.128452	0.328184

Summary:

The averages and most of the indices came out very similar between the two species. Medial palatal length over breadth at canine alveoli was the only in-

dex that has significant differences with little overlap. However, more specimens need to be measured to see if the index truly exists. Also, other canid species could be measured and compared to see if evolutionary relationships can be defined by this index.

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DETERMINING FORM AND FUNCTION: AN ANALYSIS OF USE-RELATED WEAR ON *STROMBUS GIGAS* SHELL TOOLS

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The objective of this paper is to present the findings of my research on shell artifacts in southeast Florida. Collected data comes from my analysis of 21 *Strombus gigas* shell tools in the collection of the Anthropology Department at Florida Atlantic University. These samples were recovered from the Boca Weir and Jupiter Inlet sites, both of which are representative of a southeast Florida village complex. A *Strombus gigas* shell artifact typology is presented along with supporting analysis of macro/microwear variables. The methods of Masson (1988), Eaton (1974), Keegan (1984), and Andrefsky (1998) serve as a framework and source of reference for this study.

Background

There are many varieties of shell resources in southeast Florida including *Busycon contrarium*, *Strombus costatus*, and the subject of this study, *Strombus gigas*. Also called queen conch, this large herbivorous mollusk of the class *Gastropoda* is an abundant specimen on the southeast coast of Florida and in most Caribbean coral waters. According to Masson (1988), shell celts from southeast Florida indicate a regional adaptation to *Strombus gigas*. Some researchers have designated this adaptation as an adjustment to the lack of viable lithic resources in this particular region. Experiments by Eaton (1974) have demonstrated that shell celts have a density comparable to moderately compacted stone lending support to the perception that they are a practical substitute for lithic raw materials.

Celt Technology

Although shell tools can be manufactured from the lip, outer whorl, and columella portions of *Strombus gigas*, only 'lip tools' are represented in this sample. Both Eaton (1974) and Rouse (1941, in Keegan 1984) identify four categories of *Strombus gigas* 'lip tools': adzes, celts, blanks, and scrapers. Although hafted and unhafted axes and scrapers were recognized along with blanks, exclusive adze tools were not among the artifacts recovered from the Boca Weir and Jupiter Inlet sites. Many researchers have referred to blanks as preforms. Although blanks lack a true beveled edge, Keegan (1984) has

observed end battering and believes that many celt blanks were complete functional tools. A fifth category of 'lip tool' was identified in this study. Rouse (1941, in Keegan 1984) refers to these as ceremonial/ritual hammers. They are often called 'three pointers' after their lithic counterparts of the Greater Antilles (Coomans 1965, in Keegan 1984).

Morphological Characteristics

Fortunately, Masson (1988) has developed an analogical morphology borrowed from lithic analysis to serve as a framework for the study of shell artifacts. What follows is a summary of her morphological descriptions. Figure 2 is reproduced from Masson (1988) and illustrates the areas of the tool defined below. The ventral face of the celt refers to the former interior surface of the shell while the dorsal face refers to the former exterior surface. When the celt is viewed on a level surface, ventral face up and distal end away from the examiner, the left and right lateral edges are easily determined. Unless modified to the contrary, the left lateral edge is generally thicker than the right lateral edge. The working edge, located at the wider distal end, is called the bit has a ventral and dorsal bevel. The narrower end, which is also the base of the celt, is called the proximal end. Longitudinal direction refers to the measurement associated with the length of the tool from distal to proximal end. Latitudinal direction runs from one lateral edge to the other and lies perpendicular to the longitudinal axis. In addition, Keegan (1984) lists three distinct shell morphologies based on growth and lip form that are a natural source of variation. These morphological classifications are as follows: 1. Full, thick-lipped ("Old"), 2. Full, thin-lipped ("Adult"), 3. Pre-lip ("Juvenile"). Shell morphology will become more variable during ontogeny as a result of the phenotypic expression of genotype (Keegan 1984). Before an accurate recording of measurements could be taken, it was first necessary to determine which attributes would be included in the study and what type of attribute scale would be used to order them. A ratio scale was chosen due to its completeness and range of operations. I differed from Masson (1988) in my methods of measurement and instead chose to follow an approach set forth by Andrefsky (1998). When measuring length, the maximum linear distance of the tool was recorded. This was accomplished by stretching a string along the worked edge of the tool following any contours. The string was then measured in order to yield maximum edge length. Using string allows for accurate distance measurements on surfaces that may be curved or sinuous (Andrefsky 1998). The same method was used to record the width or maximal expanse of the tool that is perpendicular to tool length. Left and right lateral thickness is a measurement of the tools' edges at their greatest point. The bit forms the edge angle where both ventral and dorsal bevels are

intact. Maximal weights of the tools were also recorded.

Post-Depositional Modification/Organic Decomposition

Shell, like any organic material, is subject to deterioration and decomposition. The combination of humic acids and groundwater in the soil produce a leaching of the shells calcium carbonates which causes the shells surface to become white and chalky (Allerton 1981 in Masson 1988). With the progression of time, traces of usewear become increasingly harder to differentiate. 38% of the FAU celts suffered from the effects of leaching. Another form of post-depositional modification is called concretion. Concretion occurs from the cementing of the soil attached to the surface of the shell. Once enveloped, it is impossible to record accurate measurements (Masson 1988). Only 14% of the FAU celts displayed significant signs of concretion. Masson (1988) noted a third type of non-cultural impact termed peeling. This appears as the loss of some of the growth layers on the ventral/dorsal surfaces. 52% of the FAU celts exhibited the effects of peeling. A few of the celts were just beginning to show signs of peeling while several others were already at a very advanced stage. Keegan (1984) observed another form of decomposition that occurs at such an advanced stage that the shell has deteriorated to the point of resembling severely oxidized iron. None of the FAU celts experienced this type of post-depositional modification.

Artifact Manufacture

Keegan (1984) notes that *Strombus gigas* 'lip tools' can only be manufactured from morphologically 'adult' or 'old' shells. The artifacts examined in this study exhibited a relatively even distribution between the two. There were no celts manufactured from morphologically 'juvenile' shells because, unlike mature specimens, 'juveniles' lack the presence of a well-developed lip. There are at least two major steps involved in producing a *Strombus gigas* celt: Conch lip removal and the ensuing modification to form a completed celt. The experimental work performed by Keegan (1984) and Masson (1988) was used as a guide in understanding these processes. Keegan (1984) illustrates the external and internal structures of the queen conch discussed below. Lip tool manufacture begins with the detachment of the lip from the shell to produce a blank. Keegan (1984) performed replication experiments using two slightly different methods. His first method involved placing the conch aperture side down and then striking the dorsal surface with a *Strombus gigas* hammer. This produced a system of fractures along the outer margin of the lip where contact with the ground had been made. His second method yielded improved results. The dorsal side was placed on the ground while the lip remained slightly elevated. A *Strombus gigas* hammer was then

used to strike the interior of the aperture. Keegan (1984) describes this procedure as wedging the conical hammer into the aperture to strike behind the area of lip thickening. This technique left the lip unfractured with a portion of the body whorl still intact. Masson (1988) achieved conch lip removal without the use of a *Strombus gigas* hammer. She accomplished this by slamming the conch aperture side down onto limerock. Her second method required slamming the conch shells against one another. Regardless of the method employed, it is important that the blows be directed where the spire margin canal attaches the lip to the whorl at the shell's posterior end (Masson 1988). Materials used to modify detached lips into finished tools exhibit a local variability that is dependent upon the raw materials available. Modification involves light percussion flaking/shaping and subsequent grinding of the lateral edges and bit. Masson (1988) notes that percussion flaking/shaping reduces the amount of grinding necessary to produce a finished tool. Percussion flaking/shaping that utilizes harder blows has a tendency to produce less consistent breaks than do strikes of moderate force (Keegan 1984). Percussion implements used include *Strombus gigas* hammers and columella tools, other conchs, limestone, and imported materials such as chert (Masson 1988). A variety of artifacts used to grind shell celts have been found at south Florida sites. Imported sandstone and locally abundant limestone proved efficient in the grinding of lateral edges and bits (Masson 1988). Shark skins have been found in association with shell tools indicating that they may have been used in the grinding process. Pumice and coral rasps are also believed to have functioned as abrading implements in the absence of more suitable grinding materials. Methods used in lithic technology to shape the bit involve a risk of breakage not found in the grinding of shell celts. This is why the choice to grind the more time consuming bit first or to grind the lateral edges first seems to have been a random decision (Masson 1988).

Typology

For the purpose of this study a functional typology was developed that can be used to classify *Strombus gigas* shell tools. This typology is supported by microwear analysis, macroscopic observation, and patterns of association. Interrelated variables such as morphology, hafting, edge angle, patterns of breakage, and organic residue were incorporated to provide a comprehensive ordering scheme.

Function

Replication and usewear experiments have proven shell celts to be efficient woodworking implements. Eaton (1974) has determined that shell celts are effective in cleaving, chopping, chipping, adzing, and scraping both wood

and bone. Woodworking, particularly in the manufacture of dugout canoes, produces the most visible evidence of usewear. Some researchers have suggested that shell celts may have been used for butchering and working hide. This, however, is difficult to prove because these functions leave behind little evidence of use (Masson 1988). Artifacts in this study have been categorized as axes, scrapers, blanks, or ceremonial/ritual hammers. The resulting percentages of each type in relation to one another are as follows: Axes – 62%, Scrapers – 24%, Blanks – 9%, and Ceremonial/Ritual Hammers – 5%. It should be noted that the ceremonial/ritual hammer recovered from the Jupiter Inlet site was not found within a ritual context or in association with other ritual implements. Consequently, its' designation as a ceremonial/ritual hammer is based on morphology alone and subject to speculation. In addition, 50% of the blanks examined in this study exhibit evidence of use and are believed to have functioned as *Strombus gigas* hammers. Marquardt (Figure 14: 1992) refers to these as gastropod hammers, unhafted. Although this designated function correlates with Keegan's research (1984), the onset of organic deterioration made distinguishing between human and naturally produced wear virtually impossible. These types are broken down further according to an assortment of variables. Support for these classifications is presented in the ensuing sections of the paper.

Stages of Growth and Tool Function

Scrapers, manufactured from morphologically "old" shells, are among the largest and heaviest tools in the study and would appear to be the most practical woodworking implements. Appearances can be deceiving. Masson (1988) has found that the elasticity of shell is such that the older shells are more easily broken. Based upon this evidence one would expect to find the greatest degree and number of impacts and breakage on morphologically "old" shells, yet these tools exhibited no evidence of impact or breakage. This evidence, along with the perception that a larger tool is easier to manipulate, was used as a basis for their classification as scrapers. Further evidence is presented in the discussion on edge angles. Axes were manufactured from both morphologically "old" and "adult" shells. This type of tool undergoes high levels of stress and produced all observed impacts and breakage in the study. The difference between the two may reflect the density of the worked material. Blanks were manufactured from morphologically "old" shells for undetermined reasons and may have been selected arbitrarily. The ceremonial/ritual hammer was manufactured from a morphologically "old" shell and is most likely due to the shear size and visibility of the tool. The nature of use will inevitably necessitate that a tool be reworked, oftentimes changing its' form and function. The possibility exists that these tools are

transitional forms and could conceivably have been used in other capacities at one time or another.

Hafting

Many researchers have acknowledged that hafting increases the efficiency of both shell and stone tools. 19% of the artifacts were identified as hafted axes and another 5% were classified as hafted scrapers based upon macroscopic observation and low power (<100x) microscopy. This evidence appears as grooves/indentations along the lateral margins of the tool. With the exception of the hafted scraper, these tools produced some of the greatest evidence of impacts and breakage in the study. It's unlikely that these impacts resulted from a hand-held function. (Masson 1988). Further evidence of hafting is provided by the presence of a resinous organic residue in association with haft marks. Resinous substances are often used to secure the lashings of hafted implements. Some of the grooves/indentations conform to what Masson (1988) describes as side-lashed. However, in light of the absence of replication experiments and a larger sample, this designation is subjective.

Edge Angle

Variability of the edge angles observed in this study reflect different functions that I have assigned into four groups based upon angle measurements and macroscopic observation of impacts and breakage patterns. An edge angle of 28-41 degrees was observed on 48% of the artifacts and is associated with a chopping function. This group also received 70% of the attributed impact scars and breakage patterns. An outlier with an edge angle of 60 degrees was placed into this group as a result of its' sizeable impact scar and similarity in tool design. Edge angles of 45-59 degrees were observed on 19% of the artifacts and are associated with a cutting function. This group received 30% of the attributed impact scars and breakage patterns. An outlier with an edge angle of 40 degrees was placed into this group due to its' lack of scarring or breakage, however, the absence of significant wear may just reflect the degree of use. An edge angle of 60-70 degrees was observed on 24% of the artifacts and is associated with a scraping function. Andrefsky (1992) notes that artifacts with wider edge angles can be pulled or pushed over materials such as hide with little chance of puncture or laceration. In general, the heaviest, widest, and thickest tools also had the most obtuse edge angles. 9% of the artifacts lacked a ground bit hence, their classification as blanks.

Wear and Breakage Patterns

Masson (1988) defines wear as impacts that do not produce artifact fragmentation. Macroscopic observation and low power (<100x) microscopy were

used to classify 76% of the sample according to distal impact scars, battering, and distal nicking/edge breakage patterns. Distal impact scars were observed on 29% of the sample. 67% of the identified distal impact scars were observed on celts with edge angles of 28-41 degrees supporting their classification as chopping tools. All distal impact scars occurred between the center and right lateral edge of the tools. These same tools had a thicker right lateral edge relative to the left side. Masson (1988) notes that the increase in mass on a particular side absorbs more of the force and receives the most impact scars. Excessive battering resulting from tool use after the working edge had been dulled occurred on 43% of the artifacts. This evidence appeared as multiple layers of minor fractures on the working edge when viewed at a magnification of 100x. Distal nicking/edge breakage was used by Masson (1988) to replace hinge and step flaking which do not affect shell celts. This evidence was also viewed under low power and appeared as nicks or chips in the working edge that were too small to be classified as impact scars. 48% of the artifacts exhibited evidence of this type of wear. Diagonal breaks, snap breaks, and longitudinal splits were used to classify 67% of the specimens in this study. Masson (1988) notes that diagonal breaks follow the natural cleavage of *Strombus gigas* lip structure. Diagonal breaks were observed on 19% of the artifacts and, like distal impact scars, occurred on sides with the thickest lateral edges. A diagonal break occurred to both the left and right side of one artifact indicating that it was still used after one diagonal break had already flawed the tool. The type of break could not be determined for 24% of the artifacts. Snap breaks occurred on 57% of the sample, mostly to the middle area of the tool. Shafer (1982 in Masson 1988) believes that this is evidence of hafting. However, only 17% of the identified snap breaks occurred on artifacts determined to have been hafted. The lack of a larger sample makes this determination difficult to justify. Longitudinal splits occurred on 14% of the artifacts and also correlated to lateral edge thickness. Masson (1988) notes that this type of impact is unique to shell celts and reflects the brittle nature of shell composition.

Microwear Analysis

This study utilized both low (<100x) and high (>100x) power microscopy to analyze distinctive and diagnostic wear traces (residues, polishes, striations) as they appear on the surface of shell celts. The integration of the three provides a more comprehensive understanding of the tools' function and of the material worked than do analyses which place emphasis on a single variable. Organic residues were observed on 71% of the artifacts in this study. 200x magnification proved most effective in the analysis of residues. The most common substances were resinous, calcareous, and dark reddish or reddish/

brownish in appearance. Residues appear mostly in areas of intensive use where they became imbedded within the nicks, scars, and striations of the shells' surface. The residues all appear to be of a plant-based nature, however, without a chemical analysis of the substances this is difficult to determine. As previously indicated 60% of the hafted celts displayed residues in association with haft marks. The formation of polish is the result of progressive smoothing by abrasion and is most evident under high power microscopy. Polishes were observed on 62% of the artifacts. Artifacts were viewed under varying degrees of lighting that ranged from moderate to bright so as to maintain a degree of objectivity. Polishes viewed under 200x magnification appeared as glossy reflective patches on the tools' surface that were indistinguishable from one another. Observation under 400x magnification produced noticeable directionality of the polish formation that coincided with the identified striations. Although types of activity could be inferred from this study, distinctions between polishing agents could not be accurately determined without the use of a computer imaging analysis program. Evidence of striations on the tools' surface was most evident at a magnification of 400x. Striations were observed on 62% of the artifacts in three generalized directional patterns that indicate tool function. 54% of this group had striations that were perpendicular to the working edge and indicate an overhand motion associated with a common everyday cutting/slicing function. 23% of the group displayed striations that were disposed at 90 degrees to the working edge and are associated with a whittling function. 8% of the tools had striations that were disposed parallel to the working edge and are attributed to some manner of sawing activity. The remaining 15% of the tools exhibited an unrecognized and random distribution of striations that most likely occurred after deposition by natural agents. The fact that polish formations correlate with striation directionality suggests that these artifacts were definitely modified through human use as tools. Organic residues were also found on 85% of the artifacts displaying striations. The significance of this has not yet been determined.

Conclusion

The parallels between lithic analysis of both stone and shell tools were made apparent by the research of Masson (1988). This study has also concluded that shell tools exhibit patterns of wear that can be classified and examined according to methods designed for the study of lithics. Affinities between morphologies, edge angles, and patterns of wear and breakage indicate that *Strombus gigas* shell tools exhibit a relatively low degree of polytypism and high levels of polymorphic variability. Unlike Masson (1988) who observed an increased thickness and subsequent greater degree of impacts and break-

age on the left lateral edges, this study found the distribution of lateral edge thickness to be relatively even with evidence of impacts and breakage occurring predominantly on the right side. The relative weights and sizes of the tools examined in this study, with regard to their functional classifications, do not agree with previous shell tool research (replication experiments). It must be noted that this usewear study was conducted upon an extremely small sample without the benefit of first hand replication experiments and lacks a chemical analysis of the organic residues. The researcher believes that the findings presented within this body of research are justified in this particular instance and lend support to the perception that shell tools are highly variable and should be examined with this notion in mind. Rapid advancements in technology and the development of expert systems are providing new insights into an expanding field of shell tool research. Shell artifact research, in general, should be recognized for its importance and usefulness in determining both the material and non-material culture of the artifacts' manufacturers. Comprehensive studies on shell artifacts can now be combined with data from other disciplines to help determine the overall role of these objects within the individual societies. The researcher also believes that an anthology containing past and present shell artifact research from southeast Florida that includes relevant studies from other regions should be compiled and correlated for the express purpose of providing future researchers with comparative data.

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FRANZ BOAS AND BRONISLAW MALINOWSKY: A CONTRAST, COMPARISON, AND ANALYSIS

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To understand the individual personalities and hence the individual accomplishments of Franz Boas and Bronislaw Malinowski with regards to the field of anthropology, one must understand the schools of thought utilized in their approaches to conducting fieldwork and methodology. Through these basic understandings, one can see not only the accomplishments made, but also the lasting impressions left in and the influences they have had on the field of anthropology. To both Boas and Malinowski, the collection of data was a meticulous process. Both believed that without direct ethnographic field research, data was essentially useless. This is in direct contrast to the approach taken by many of the 'armchair theorists' of the nineteenth century. These individuals, such as Sir Edward Burnett Tylor believed that anthropologists did not need to be involved in data collection whatsoever, but that their job was to compile, organize, and classify the data in an evolutionary timeline. Tylor goes on to suggest that it is not who collected the data that is important, but rather the data itself (McGee & Warm's 2000:31).

To both Boas and Malinowski, the meticulous collection of ethnographic data by a properly trained researcher is paramount to understanding the material in its correct and intended format. Though Boas and Malinowski may have had similar views on the importance of fieldwork, they differed on the actual methodology. Boas focused on the history of a culture. He felt that only by recreating the culture from a historical perspective could the cultural phenomena be properly explained. Boas, while differing in the process of data collection, did have some consistent views on the importance of history with those of Tylor. Both believed that culture is an evolutionary phenomenon and that by tracing its developmental history one could understand and explain it, though their reasons for this thinking differed (McGee & Warm's 2000:29). Malinowski saw the reconstruction of history as a waste of time, and that the only way to properly explain a culture was to not only live among them, but also to participate in all daily activities. Through this participant observation an outsider (the anthropologist) could carry out an unbiased and completely objective study of the culture. The purpose of this paper

is to analyze, compare, and contrast the different methodologies and data collection techniques of Franz Boas and Bronislaw Malinowski. Both of these men were and still are extremely prominent and important anthropological figures, and their influences within the field of anthropology are invaluable. Through these explanations, one will realize and begin to understand the different schools of thought (American and British primarily) and how and why they influence perceptions still to this day.

Background

Franz Boas (1858-1942), a well known and highly thought of anthropologist is sometimes referred to as the father of American anthropology. He grew up a German born Jew under the roof of a prosperous businessman and a somewhat unusual, but civically active mother who founded the first Froebel Kindergarten. He spent the first nineteen years of his life in this environment, where he took an interest in botany and various other natural sciences (Kroeber 1943:5), which would later play greatly into his research methods. His academic career continued at universities in Heidelberg and Bonn where he studied geography and physics. He continued on to obtain his doctorate at Kiel in 1881. His dissertation, "Contributions to the Understanding of the Color of Water", dealt with the absorption, reflection, and the polarization of light in seawater (Kroeber 1943:5). Bohannon and Glazer with regards to Boas' transition to anthropology state:

A staunch believer in the value of first-hand information, he decided in 1883 to undertake a geologic expedition to investigate seawater under Arctic conditions. His year-long stay with the whalers and Eskimos turned Boas into an ethnographer and convinced him that the knowledge gained by mere observation is useless without understanding the traditions that condition the perceiver. This realization, along with the warm friendships of his Arctic hosts, precipitated what was to become his life-long interest – field research as a royal road to anthropology (1973:81).

No sooner than did Boas accept a position in geography at the University of Berlin in 1886, when he became 'inspired by a group of visiting Bella Coola Indians' that prompted the beginnings of his lifelong study of indigenous peoples of the Northwest Coast (Bohannon and Glazer 1973:81). After a year of fieldwork in British Columbia, Boas returned to Germany, married, and decided to become an American (Bohannon and Glazer 1973:81 and Lowie 1937:129). Amongst his fieldwork with the British Columbia tribes, Boas obtained his first position in the United States at Clark University in

1889. He left his position at Clark and from 1892-1894 he worked on the anthropological exhibits at the Chicago World's Fair, which he left due to personal conflicts. From Chicago, Boas moved to the American Museum of Natural History in New York (where he again was forced to resign due to further personality conflicts) and soon began teaching at Columbia University where he stayed until he retired in 1936 (Lowie 1937:129). There is some discrepancy with regard to the ability of Boas' teaching. Though he trained a generation of 'brilliant and productive anthropologists' such as A.L. Kroeber, Paul Radin, and Edward Sapir, his lectures were seen as less than desirable by many (Bohannon and Glazer 1973:82). Franz Boas was a stubborn, if not abrasive man towards many with the exceptions of his family and closest, most talented students with which he was a warm and caring man. The scars on his face are reportedly from several dueling encounters he had while in college (quite possibly due to problems associated with him being of Jewish descent), but on more than one occasion he claimed them to be from polar bear clawing (Bohannon and Glazer 1973:81).

Bronislaw Malinowski (1884-1942) was born to an aristocratic and cultured family in Krakow, Poland. This environment provided him with a multilingual background and taught him a sense of worldliness. He received a doctorate with honors from the University of Krakow in mathematics and physics in 1908 (Voget 1975:513). Shortly thereafter, Malinowski was stricken with tuberculosis, and it is during his recovery time that he became enthralled with the field of anthropology. During his recovery he read Frazer's *The Golden Bough* as his "first attempt to read an English masterpiece in the original", and this was his inspiration (Bohannon and Glazer 1973:272).

In 1910, Malinowski began his anthropological graduate work at the London School of Economics where he later obtained a doctorate in 1916. It is during these years that Malinowski is introduced to the people of Mailu and the Trobriand Islands with whom he would later spend a great deal of time researching (Bohannon and Glazer 1973:272 and Voget 1975:513-514). Malinowski was in the field when World War I broke out, and being an Austro-Hungarian national, technically was considered to be an enemy-alien. With common sense and cool heads prevailing, Malinowski was permitted to remain in the field instead of being detained. It is during these years that he gathered the majority of his information on the Trobriand Islanders from which his many classics were based (Bohannon and Glazer 1973:273). Upon his return to Australia in 1918, Malinowski married Elsie Masson, the daughter of a University of Melbourne professor.

One can see the effects of his separation from his now published private diary that he was depressed a great majority of the time and suffered both psychologically and physically, patterns that would trouble him for the remainder of his life (Bohannon and Glazer 1973:273). In 1921, he began teaching at the London School of Economics, where he later became the school's first professor of anthropology. Malinowski's teaching abilities were exceptional, and like Boas, he too trained an entire generation including E. E. Evans-Pritchard and Raymond Firth (Bohannon and Glazer 1973:273). Firth says that "almost more than anything else, Malinowski was a great teacher." He says that Malinowski was a gifted, inspiring, and perceptive man in addition to his complex and highly intelligent personality (1957:7-8). He was in the United States when World War II broke out and stayed there until his death in 1942. While in the U.S., he did work with the Zapotec Indians in Oaxaca, Mexico during summer vacations and was appointed as a professor at Yale shortly before his death (Firth 1957 2-9).

Schools of Thought & Methodologies

Having a basic understanding of the backgrounds of these two individuals, one can now move forward and with more confidence begin in the process of understanding their schools of thought and approaches to fieldwork. Both Boas and Malinowski started out within the field of the physical sciences and were educated in Germany and Poland respectively, but the majority of their influences within the anthropological field were made in the United States and England (Barnouw 1971:38). With these similarities one can see how and why their ethnographic research was performed with such detail and complexity. Even though there were some similarities between these two prominent anthropological figures, the differences in their processes and methodologies were at times notable.

Franz Boas – The Historical Method and Natural History Approach

Boas' early experiences on Baffin Island led him to the conclusion that would stick with him and dominate his anthropological career. According to Barnouw, this conclusion showed Boas that:

Geography plays a mainly limiting rather than creative role. The Eskimos did things in spite of their environment, not just because of it; they had a particular history and set of traditions behind them which were different from those of other northerly peoples, such as the Siberian Chukchee, who lived in a similar environment. A culture is shaped by many historical forces, including contacts with other societies (1971:39).

Boas felt that the 19th century cultural evolutionists made premature generalizations based on poor and inadequate information. This information was obtained, not from a qualified researcher, but rather from individuals “who often had only a biased, superficial understanding of the people they were observing” and provided more conjecture than fact (Barnouw 1971:39). Boas (and later, his students) made it a point to criticize these views and methods and said that we must first get the facts in order to build a reliable body of ethnographic data from which better generalizations then can be made. Boas used all fields of anthropology to ascertain proper information in the proper context. This full-bodied approach allowed Boas to reconstruct “the history of the growth of ideas with much greater accuracy than the generalizations of a comparative method” (Hyatt 1990:43).

Cultures to Boas were unique and entirely separate entities, and therefore could in no way, shape, or form be compared to another even if under similar social, economic, and environmental conditions. Boas wanted to study each culture in its entirety rather than in bits and pieces. By studying a unique culture in its entirety; by investigating customs, language, social systems, and by even collecting physical measurements, one can understand a cultures’ psychology. Hyatt goes on to say that ,”merging these together, the anthropologist could then penetrate the ‘psychological factors’ that shaped a culture and ascertain the extent to which ‘historical connections’ contributed to the lifestyle of a given society” (1990:43).

Boas’ early viewpoints on culture showed he thought very little of the individual on the whole. This is in direct opposition to Malinowski’s views, but over time Boas changed his views somewhat, though not to the extent of Malinowski’s. This created a rift between his followers on the importance of the individual within a society (McGee and Warms 2000:137). This view changed in part due to his realization that whether or not the person was “typical” to his/her society, the society or culture therein has boundaries set up to keep individuals within the norms of what is and what is not acceptable to them. Boas used this also as a crutch supporting his view on the collection of data from informants. He felt that he could obtain all the knowledge needed to understand a culture from a few key people. This is in part also to the fact that one can only obtain knowledge from persons willing to or having the time to dispense it (Goldschmidt 1959:58-59).

Bronislaw Malinowski – Functionalism, Participant Observation and the Individual

“The archfunctionalist of anthropology, Malinowski is regarded as a founder of modern functionalism in anthropology” (Bohannon and Glazer 1973:274). His ideas of functionalism point to the needs of the individual in turn become the needs of the society. Bohannon and Glazer comment that,

Malinowski’s functionalism is founded on what he regards as the seven basic needs of man: nutrition, reproduction, bodily comforts, safety, relaxation, movement, and growth. The individual needs are satisfied by derived cultural and social institutions, whose functions are to satisfy those needs. In other words, every social institution has a need to satisfy, and so does every cultural item. Malinowski’s view of culture is also based on human biosocial needs - he regards culture as a tool that responds to the needs of human beings in a way that is above any adaptation (1973:274).

This particular view of functionalism, unique to Malinowski, shows that “various cultural beliefs and practices contributed to the smooth functioning of the society while providing individual biological or psychological benefits” (McGee & Warms 2000:158). The individual was imperative because it is the individuals who make up the group. These individuals therefore are good representations of the group because it is they who perform the daily activities, rituals, and so on. This is the key to understanding a culture according to Malinowski. Malinowski, like Boas, believed that only through comprehensive and detailed fieldwork could a proper ethnography be done. He actively hunted for information using a variety of techniques and was renowned for his detail in data collection, but did not feel that such data was sufficient, no matter how detailed. To him, only by working side by side, doing the things the natives do could an ethnographer understand the subtleties of a culture that would otherwise remain unseen (Firth 1957:78-79). Sir James Frazer further points out in the preface of *Argonauts of the Western Pacific* the thoroughness of Malinowski’s fieldwork and his ability to see within a culture:

It is characteristic of Dr. Malinowski’s method that he takes full account of the complexity of human nature. He sees the man, so to say, in the round and not in the flat. He remembers that a man is a creature of emotion at least as much as of reason, and he is constantly at pains to discover the emotional as well as the rational basis of human action (1922:ix).

Critics and Contributions

No matter what influence Franz Boas had on the field of anthropology, he still had his critics. Boas refused to theorize about developing anthropological laws and was seen by some as a hindrance and a detriment to the field. He was focused on precise methodology and a strict scientific method. He was concerned about the reconstruction of history, not with the formation of laws derived from it (Hyatt 1990:44). Boas did not technically leave behind a "school of thought", but rather a handful of individuals trained by him and left to develop and make their own decisions for better or for worse (Voget: 1975:337). Not only did Boas use the four-field approach in his fieldwork (cultural, archaeology, physical/biological, and linguistics), but also in his everyday life. Boas combated racism the majority of his life, and I feel that this was a compelling factor in his becoming an anthropologist. He used his position and expertise on more than one occasion to fight racism on all fronts and this agenda continued on until his death. Having been born into a Jewish family in Germany and seeing the rise of Hitler's Nazi party in the 30s and 40s further provoked his feelings on this matter.

Malinowski's field research was thought by many to be a wonderful example of completely unbiased work by an extraordinary anthropologist. While it very well may be a wonderful collection of detailed data, it was hardly unbiased. While he was doing fieldwork in the South Pacific, he battled periods of depression and anger pointed towards the indigenous peoples. His diary (1967) repeatedly shows slanderous and racial remarks towards informants and his constant reliance upon the needle to battle his depression and loneliness. These discoveries came as a great shock to many within the anthropological community upon the release of his diaries. The amazing thing about Malinowski's biases is that he was completely aware of them and took the appropriate measures to ensure they did not interfere with his fieldwork. Not only did he do this, but he was also his own hardest critic.

Raymond Firth said that:

Malinowski considered it the duty of the anthropologist to render a careful and sincere account of his credentials and his mistakes in the field; and in Appendix II to *Coral Gardens*, he recorded his 'Confessions of Ignorance and Failure'. He admitted that a general source of inadequacies in all his material, whether photographic or linguistic or descriptive, consisted in the fact that, like every ethnographer, he was lured by the dramatic, exceptional, and sensational; and he castigated himself for not treating the 'drab, everyday, minor

events with the same love and interest as sensational, large-scale happenings' (1957:79).

Biased or not, Malinowski's works remain classics within the field.

Conclusion

Nearly sixty years after their deaths, which coincidentally both happened in 1942, Franz Boas and Bronislaw Malinowski still continue to be central to the discipline of anthropology. The approaches, schools of thought, and methodologies introduced by Boas and Malinowski are still paramount to the field. This was seen at an early time when A.R. Radcliffe-Brown described the emergences of these trends in 1929. He said there were two different and opposing tendencies in the study of culture. One being the American based view of Franz Boas, which he called the most popular. This regards culture purely from the historical standpoint, and "attempts, in the absence of any historical records, to multiply and elaborate hypothetical reconstructions of an unknown past." The second view, associated with the British and Malinowski, had to do with treating each culture as a "functionally interrelated system and to endeavor to discover the general laws of function for human society as a whole." He goes on to say, "It does not neglect the historical point of view, but regards the processes of social change as something to be studied by actual observation over a period, or by the use of authentic and detailed records." This process accepts history but rejects hypothetical history (Naroll & Naroll 1973:187).

Whether or not Boas or even Malinowski would have accepted this point of view is inconsequential. The fact of the matter is that the point was made about the differences in method. To say one is better than the other is not only impractical, but also irrelevant. No one way of doing something can be entirely right or entirely wrong. So is the case with this. People use things to their liking, or as the use suits them, and ethnography is not (at least shouldn't be) any different.

It is unfortunate in my eyes that there is no adequate way in comparing these two men other than the format given; that is the broken manner in which material is presented. There is no format that allows such detail to be commingled with other information without confusion or repetition setting in, hence the reason I have chosen to separate these two men and their methodologies into different sections and allow the reader to compare, contrast, or ignore the information presented in the manner they see fit. By no means is this an adequate representation of the importance of such anthropological greats as

Franz Boas and Bronislaw Malinowski. It is however an attempt at shedding some light on their roles and contributions within the field of anthropology to not only the layperson, but also the professional.

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GENERAL DEVELOPMENT TRENDS IN ECUADOR: POLITICAL AND ECONOMIC INFLUENCES ON CONSERVATION

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Ecuador is a small country located on the northwest corner of the South American continent. Intertwined within its boundaries abounds a wondrous array of diversity. Three diverse regions encompass the geography of the land: the Costa, the Sierra, and the Oriente. The Costa region borders the Pacific Ocean and consists of lowlands, mountains, and rolling hills dividing the river valleys. The Sierra is composed of two major chains of the Andes: the Cordillera Oriental and the Cordillera Occidental. Traditionally untouched, the Oriente remained relatively isolated until the 1970's when the government began promoting the colonization of the rain forest frontier. Today, after rapid colonization and the oil reserve exploitations of 1967, the jungles of the Oriente are suffering and indigenous cultures are pushed further into the forests.

Over the years, the government and military have had a particularly influential role in the construction of human development. Constant political unrest and a multitude of political leaders lead to a free-for-all in terms of social growth and economic development. It was not until the importance of tropical forests was realized that a more sustainable approach to development was employed. Eco-tourism and other new approaches found in wildlife reserves are just some examples of integrated approaches that need to be implemented across the globe in order to maintain the biodiversity of this planet. The goal of this paper is to examine the effects of Ecuadorian governmental policy on the environment, as well as to the forms of growth and development in Ecuador.

Influential Government and Military Forces

Following the Second World War, Ecuador and much of Latin America was faced with an economic crisis (Isaacs 1993). Import substitution policies, bringing consumer goods into a new area to be produced instead of being imported, were adopted by the government in attempts to fulfill the heightened

import desires of the people. Due to the overvalued exchange rate, the economic status of the country worsened. The population of Ecuador, in the 1950's, tipped slightly above 3 million and has a social structure that subjected 52% of the population to extreme poverty and exploitation; European and North American ideals began to overtake traditional, native values (Hurtado 1985).

Between 1963 and 1966 military rule pursued development through industrial measures. When import substitution policies began to reveal signs of exhaustion, the demand for foreign banana imports disintegrated. Impairment of the government ensued with a decline in the ability to purchase the imported goods of Ecuadorian industrialization. In such a position, the government placed hopes on major oil exports to alleviate economic stresses. Projections from the Texaco-Gulf Consortium estimated 250,000 barrels of crude oil flowing through a pipeline constructed in the eastern jungles of Ecuador; petroleum exports valued at US\$200 million, in 1973, assured impending recuperation (Isaacs 1993). Yet, with developmental trends shifting toward oil exploration, new forms of technological dependency arose. Requirements necessary to extract oil stipulated increased foreign technology imports. The prevailing force of foreign corporation control soon penetrated agriculture, banking, commerce, and industry in Ecuador. North American companies, such as Del Monte and Van Camp controlled half of the tuna fleet in Ecuador, as well as 50% of all of the production and processing of the harvested tuna fish (Hurtado 1985). As a whole, industrial development came to be controlled by foreign investment.

Conflicts between the two main political parties, Conservatives and the Liberals, generated political instability. Disagreement between the parties exploded during times of political campaigning and economic crises. Political conflict advocated the exchange of leadership on a multitude occasions. For instance, Jose Maris Velasco Ibarra was elected to office on five different occasions between 1934 and 1972 (Isaaca 1993). A depleted foreign reserve and a serve budget deficit gave no opportunity for stabilization or reform, while Congress and Velasco engaged viewpoints in opposition. In 1968, Velasco's rule was beleaguered with slow industrial growth and stagnant export revenue (Isaacs 1993). Congress constantly blocked Velasco's attempts to add tariffs to imports, as it would adversely affect the industrial import and interests of the elites. Velasco plotted to disband Congress and eventually, ruled by decree. Velasco turned out to be no such savior, as portrayed by popular opinion. He was in fact, ineffective and in many events his corrupt contributions led to further political and economic decline. Velasco steered

away from reform but struggled to obtain political stabilization. Political institutions, controlled by the traditional Ecuadorian oligarchy kept efforts of social and economic reform at an impasse. Velasco had established himself as a dictator with no attempts of compliance towards congress to reach any sort of compromise. The prospect of another inadequate leader approached with the elections of 1972. Assad Bucaram, the director of *Concentracion de Fuerzas Populares*, a rival populist movement founded in the 1940's, was expected to win the June elections of 1972 (Isaacs 1993). Possibilities for growth and development would again dissipate, due to the projected disorganization of the administration. At this point, the military was hesitant to allow Bucaram into office and decided to intervene.

Corporate interests, civilian support, and institutional concerns all impelled military intervention. Opportunities tied to economic recovery also resulted in the intervention of the military. The role of the military came to be the consolidation of political power in the middle class, rather than the protection of middle class interests (Isaacs 1993). If the middle class is consolidated then the thought was that middle class interests would resemble those of the elites. The military declared the establishment of institutional foundations dedicated to the reform of socio-economic order. Armed forces proclaimed the commitment to bridge regional and class inequalities and affirm national sovereignty, but the enactment was simply a call to arms (Isaacs 1993).

In essence, the political and economical problems of the past directed the Ecuadorian economy toward foreign dependencies. Importation became the primary source of goods consumed by the people. The exportation of raw materials to developed countries offered little reimbursement to the Ecuadorian financial standing due to severely reduced price of exported goods. Other dependencies, such as technological machinery, developed with the drive to industrialize Ecuador. The dependant nature of Ecuador then stimulated political instability. The inability of Congress and elected officials to compromise, along with increased corporate interests, blocked any sort of reform. This allowed foreign corporations to infiltrate Ecuador and denationalize the economic political base.

With no guidance or organization elected officials attain the resources necessary for survival. With such a disorderly socio-economic status, no measures were facilitated to construct any sustainable form of growth. Anything people could find to get their hands on was used to endure. Raw materials and resources were plucked out of the tropical rainforests at alarming rates in or-

der to alleviate financial stresses placed upon the economy. This led to the deterioration of the forests. Major concern arose with the depletion of resources and the rapid development of barren landscapes; the importance of the Ecuadorian forests was beginning to be realized.

Importance of Forests

Tropical forests are an intricate part of the earth's ecosystems. Forests play a vital role in the essential processes that are needed in order to maintain the needs of every organism. The importance of these forests can be viewed through a number of diverse means, including: biodiversity, landscape and water control, climate, and rural livelihood. Above all, biodiversity has the functioning ability to provide for a number of different organisms. The abundance of biological diversity creates an area of harmonious co-existence for every living organism. Tropical rainforest areas only account for a mere 7% of the total earth's surface, yet it is comprised of 50% of the world's known flora and fauna species (Vandermeer & Perfecto 1995). However, the potential of this diversity still remains untapped. New discoveries and undocumented species are continually being revealed. One such project in the Andean cloud forests of Maquipucuna, Ecuador has attempted to construct a checklist of the vascular plant specimens located throughout the region (Webster & Rhode 2001).

The Bosque Protector Maquipucuna, a private biological reserve founded in 1988, lies on the western slopes of the Andean mountain range, encompassing nearly 4,500 hectares of mountainous terrain. Fortunately, much of the disturbance to the forest has occurred below 1500 m. of elevation, while the remaining 1300 m. of elevation can still be found in pristine form. The checklist was created in hope to increase the knowledge base of Andean plants. Drawing upon the ability to present the magnitude of endangered, recently discovered, and still unknown species; Webster and Rhode (2001) intend to promote ecological studies and conservation efforts to preserve the richness of the Ecuadorian cloud forest and develop one of the world's most extraordinary reserves of plant diversity. The forests in this region are predominately evergreen rainforests.

However, major disturbance below 1500 m. has dramatically transformed the ecology of the land. Human pressures have led to the conversion of these forests for centuries. Disturbances dating back to the 16th century have been recorded through the construction of pre-Incan settlements of the Yumbo peoples near Nanegal and the construction of the "Inca Trail," which crosses the Maquipucuna reserve; 18th century disturbances indicate deforestation

along the Río Alambi (Webster & Rhode 2001). Recent human invasion has led to the conversion of forested areas to pasture lands and fields to promote the growth of bananas, manioc, naranjilla, and sugar cane. This diversion to natural growth has stunted the growth of many species including those particularly endemic to the region. Studies conducted by H. Balslev in 1988 suggest that the western slopes of the Ecuadorian Andes contain the greatest quantity of species and the highest percentages of endemism in vascular flora alone (Webster & Rhode 2001).

The location of the Maquipucuna Cloud Forests resides 40 km northwest of Quito, Ecuador. With the proximity of the forests remaining extremely close to the residence of humans, pressures and disturbances still continue as possible threats to the land. Increasing road systems have led to increased disturbances by granting access of more people to otherwise inaccessible areas. Local communities are in dire need to environmental education programs in order to maintain the cloud forests of Maquipucuna. Preservation programs including the ecological and socioeconomic assessments of the area need to be implemented in order to ensure the persistence of biodiversity. A plethora of opportunities dwell within tropical forests. Decreasing dependence on exhausted plant types by locating alternates is a viable option. Other benefits arise in possible medical advancements with discoveries of unknown botanicals.

For years tropical forests have been exploited for the raw materials and other naturally occurring products. Early English obsessions with spices, teas, sugar, bananas, coffee, tropical hardwoods, and chocolate became a major economic push to drive into the forests and extract these products (Vandermeer & Perfecto 1995). Eventually, these desires lead to the clearing of forests. This detrimental effect led to the destabilization of the landscape. The inter-working mesh of tree roots prevents soil erosion and reduces sedimentation, thereby protecting rivers, coastlines, and fisheries by controlling the chemistry of the water (Salim & Ullsten 1999). Soil erosion has become a large concern throughout developing countries. With the increased rate of agricultural development many waterways are consumed by sediment. The nutrients found in soils (nitrogen, phosphorus, potassium, calcium, magnesium, and iron) are leaching into waterways, polluting the water, and depleting the land. The absent trees no longer absorb and store nutrients the need recycling back into the ecosystem. Desertification and natural disasters, such as mudslides and floods, now wreak havoc across the land. A problem relating to soil erosion has been occurring in the Río Ambato drainage system, in the Ecuadorian Sierra. The Ambato River, a tributary of the Pastaza River, is

located in the Interandean Valley of the central Ecuadorian Andes. The city of Ambato has a population of about 100,000 and is a chief transportation and market center of the Interandean Valley; only 1% of the region is urban, 31% is cultivated, 65% is uncultivated and used for grazing sheep, and the remaining 3% is ice or barren rock (Harden 1988). The uncultivated grazing area appears to be the main contributor to the erosion factors of the area. The other contributor to high erosion rates is the steep slopes of the region. Under-raced agricultural practices on these slopes compound the rate of erosion. With the soils retreating into the rivers, little soil is left for crop production. Thousands of people may soon be faced with food shortages.

The effect that forests have on climate is another important issue. Although quite complex and not entirely understood, forests have been noted to cause precipitation and ensure constant climates (Salim & Ullsten 1999). The removal of trees reduced evapo-transpiration, directly affecting the amount of water and energy transferred into the atmosphere. Global warming has become a concern that increases with the removal of every tree. Not only do these trees shade the surface of the earth but also consume carbon dioxide, which traps heat in the atmosphere. With the warming of the globe an array of cataclysmic events have opportunity to transpire. Glaciers may begin melting: causing increased water levels, this may lead to the destruction of coastal towns.

Loss of biodiversity will ensue with the rapid change of ecosystems caused by erratic weather conditions. Timing of birthing seasons and pollination would be altered and increasing temperatures could enhance the infiltration of parasitic organisms and disease. Rural livelihoods also depend heavily on forest survival. Forests give hundreds of millions of people the independence and resources need for survival. Wood, vines, fuel, fruits, nuts, and herbal remedies can all be extracted from the forests. Opportunities for the poor and uneducated can also be found in the forests. Small-scale processing and trading activities that require little skill and finance can act as a buffer against poverty (Salim & Ullsten 1999).

The destruction of tropical forests can promote a number of events that are both undesirable and detrimental to the well-being of the planet and every organism that resides within. By protecting our forests we have the ability to promote biological diversity, increase the stability of the landscape and water supplies, stabilize erratic weather conditions, and reduce poverty by strengthening rural livelihoods. Although material gains are immediately apparent, the effects produced by the loss of our forests cannot be recognized quickly.

Humans can now see that our intervention in natural processes have had a dramatic effect on the welfare of the planet. Preservation and restoration of forests is needed to ensure the capability of life to be preserved.

Preservation of Indigenous cultures

Understanding the relationship between culture and ecological variation through time has been an important issue of research in anthropology for year (Moran 1995). Environmental surroundings and the way in which people utilize the resources within an ecosystem, dictates the interpretations of values, customs, and cultures of those inhabitants. With the diversification of environments, an outpouring of unique variation exists between each culture. Driving forces of the environment, such as floods or lack of resources, spur the response of human populations toward decisions that are inevitably shaped by ecological constraints.

The adaptive strategies of humans have led to an ever-winding trail of integrated existence. Often times, as seen in the present, human populations have been able to overcome natural processes through the advancement of technology. Humans then, in some form, take on the ability to shape the very environment in which they live, including: mass production of food and the construction of dams and roads. By engineering a way of life, modern world systems evolved a belief that material possession is equated with wealth. Consumption through material gain then becomes a driving force through the means of production. These rapidly growing human populations therefore, exploit the environment. Often times, the desires of modern societies displace less modernized populations and may cause some cultures to become extinct. Western civilization has an alarming and ever increasing influence on indigenous peoples. As seen throughout recorded history, indigenous populations have held the ability to live sympatric lives with surrounding tropical ecosystems without encountering any extremes that hint at destruction or mass extinctions. An example of a noninvasive population is the Shuar group of Amazonian Ecuador.

The Shuar group contains 40,000 members and is the second largest indigenous group in Ecuador (Bennett 1992). The individuals of this group retain traditional ethnobiological knowledge of many plant specimens that are used on a daily basis to fulfill the requirements of their cultural existence. Eighty-eight different plants are used for the construction of boats, homes, and other permanent structures; palms, cyclanths, and bark of several species of Moraceae supply fiber for clothing and rope (Bennett 1992). Fishing lines and blow guns are made of uwi palm, while other utensils derived from na-

tive soils include monocot leaves that serve as a spice and a cooking pot for a native meal called ayampakus. Staple food resources of the Shuar (yucca, yam, papaya, sweet potato, pineapple, and peach palm) are all native to the area. Ninety species of both wood and nonwood origins are used for fuel, 245 different species of plants are used for medicinal purposes, and 27 plant species are used for personal purposes such as fragrances and adornments (Bennett 1992). Among the wide variety of other plant specimens used, one fact still remains, the Shuar have been able to thrive in a tropical habitat while using a multitude of resources without exhausting the forest. Proper etiquette of the Shuar demand the replanting of seeds found in the fruits they consume (Bennett 1992).

The Amazon region is extremely diverse and contains an array of ecosystems that reflect the variable geological history and past human usage (Moran 1995). Western civilizations must be willing to learn from indigenous cultures and customs in order to acquire a sustainable affiliation with the environment and indigenous societies (Sponsel 1995). Though indigenous cultures use subsistence activities to shape the diversity of the rainforests, the surrounding diversity is more than this simple manipulation. Forest dwellers infrequently harvest and when it is done resource extraction is minimal. On the other hand, western societies frequently harvest large amounts of resources subjecting these areas to devastating outcomes. These outcomes leave indigenous societies empty handed. The people must then disperse from their native lands and cultural heritage to escape extinction.

Growing concerns are mounting and efforts to conserve both ecosystems and the cultures that dwell within are developing. Development programs are beginning to combine guidelines for environmental conservation and protection, as well as appropriate land-use management with respect to ethnic lifestyles (Chernela 1995). A case exemplifying these new programs is the Awa Biosphere Reserve in Columbia and Ecuador. The Biosphere Reserve was initially created, in 1975, to illustrate the relationship between conservation and development patterns with sensitivity toward the ethnicities of indigenous cultures residing in the area (Orejuela 1992). The binational reserve was designed to include 300,000 hectares in Ecuador and another 800,000 hectares in Columbia (Chernela 1995). The reserve was then subdivided into distinctive zones. The first zone was the core zone. Buffer zones surrounding the core zone demonstrate balanced landscapes of traditional and natural resource land use, including secondary forests, agriculture using slash-mulch techniques under natural and manmade conditions, and maize fields (Orejuela 1992). The affected 7,000 to 10,000 Awa natives also zoned an ethnic

reserve to protect traditional territories (Chernela 1995). Beyond these zones were areas of experimentation (Orejuela 1992). These areas employed year round agroforestry practices (combination of horticulture and animal husbandry), as well as various types of sustainable development, conservation, and restoration techniques.

With the implementation of programs such as these, the ultimate goal of improving the relationships between diverse groups of humans in a particular area, while attending to the resource needs of each, can be accomplished. The devastating trends of Western development can be altered in order to maintain forests and remain respectful toward the traditions of other cultures. Again, it is only the willingness of Western societies to cooperate and change their environmentally degrading practices that will promote this type of growth and development. Recognition of diverse cultural practices will lead to the understanding and acceptance of variation. With this acceptance, programs similar to the Awa Biosphere Reserves can be established through the participation of interested parties to promote a multicultural productive process that entertains all the needs of the inclusive participatory groups.

Eco-Tourism

In the 1990's, tourism has become one of the world's fastest growing industrial divisions; by the mid-1990's, 500 million travelers crossed international lines each year (Prosser 1994). Therefore, tourism itself has a direct connection to the world economy. It thrives on economic, environmental, and cultural elements located within and outside the destination. Tourism has the ability to encourage various types of economic, social, and psychological growth, including: the attractive factor of foreign currency, exposure to rich cultural distinctiveness that would otherwise never be viewed (Prosser 1994). Although tourism relies heavily on these elements, it is also subject to cultural interpretations. Culture then has the ability to be shaped and changes, making tourism a marketable entity open to new direction and transformation.

Historically, tourism lacks an environmentally friendly disposition. Concern over the ecological impacts of tourism began to rise throughout the 1960's and 1970's, after the recognition of the ability of the tourist industry to facilitate adverse alteration and complete transforming of travel destination (Fennell 1999). The direct effect of tourism lies in the sheer numbers of people that are continuing to infiltrate other areas. This continuing growth in numbers puts direct pressure on the local resource base, which through improper use and overuse causes a decrease in the value of raw material

available. As the number of tourists increases consumption factor increases correspondingly. All tourism involves consumption. Luring tourists to particular localities involves the provisioning of certain accommodations. Those who have the means to travel usually prefer these accommodations to suite modern technological systems, usually altering the face of the surrounding ecosystem. The underlying root of destructive accommodation is then dictated by the fashion status and image of the promoted destination.

Another leading concern tied to the tourist industry is the increased ability to penetrate remote areas (Prosser 1994). Along with the degradation of local resources, increasing numbers of tourists demand more space. Development of otherwise isolated areas has become an everyday practice. The demand for such measures promotes the idea that economic based development has the right to push further into untapped regions. Unfortunately, the concept of carrying capacity is almost always neglected. The land that sustains humans every need does have limits. The earth supports billions of organisms. A particular region only has the capacity to support a set number of organisms, including humans. Manipulation and exploitation of resources severely hinders the ecosystem's capability to function at productive levels. This offset of balance, produced by human intervention, need to be minimized and regulated in order to maintain ecosystem health.

Due to the dissatisfaction with existing products, as well as growing environmental consciousness and cultural sensitivity, parts of Ecuador have recently promoted forms of ecotourism to encourage sustainable tourist development. Ecotourism is nature based, environmentally educative, and incorporates four basic principles: (1) minimize environmental impacts, (2) minimize impact and maximize respect for host cultures, (3) maximize economic gain to the host country, and (4) maximize recreational satisfaction to visiting tourists (Fennell 1999).

Many times it is the promotion and marketing of destination areas that can hinder responsibilities of the locals to protect their native ecosystems. Key principles must be integrated in to the marketing of tourism in order for a sustainable industry to exist. These principles include the promotion of resource development in an environmentally sound manner; provisioning of long-term benefits of resources to local community and industry; participatory environmental education shared by locals, tourists, industry, governmental and non-governmental organizations; recognition of intrinsic values of the resources; and promotion of moral and ethical behavior toward natural and cultural environments (Wright 1994).

The challenge today is not to stop development and change, but to incorporate sustainable environmental policies to development (Sisman 1994). Modern accommodations tend to be large scale and reflect the interests of industry. Eco-tourism tends to be small scale and locally owned and operated. Local governments play a vital role in determining the construction of attractions. The standards that need to be integrated into local development include: efficiency, consideration of wildlife and cultural heritage, proper waste disposal management, friendly interaction with locals, and sympatric architectural design (Siaman 1994). If local government endorses these types of developmental consideration, tourism will be able to co-exist within ecosystems without increasing destructive measures upon vulnerable areas. It is up to local governments to take control of tour based needs in order to profit from the tourist industry. The negligence to do so becomes environmentally depredateing because parent counties of the tourists reap all the profits. If all the profits are returned to the parent countries, no money exists for the host country to accommodate tourists sustainably.

To ensure success, eco-tourism requires the education of tourists, locals, and local governments. Since education has the ability to instill values and ethics it is the easiest way to promote ecotourism (Salim & Ullsten 1999). Through education people learn the functions of the forests and have a better concept of how important forests truly are. Education is the potential avenue through which the objective of sustainable development can be advanced. New opportunities awaken and sophisticated approaches can be extended.

VI. New Approaches

Conservationists from the West and many indigenous people share similar elements in their vision of the forests (Vandermeer & Perfecto 1995). Not only is the utilitarian values shared, but the desire for nature to persist because of its aesthetic appeal exists too. A number of instances of preservation and development exist enhancing the opportunity of integrated approaches.

One such instance is displayed in the Cuybeno Wildlife Protection Reserve, located in the Napo Province, Ecuador. In the 1970's this area was the center of the oil industry (Hinojosa 1992). Unplanned development took control of the area, settlers set out on individual paths of colonization, and

indigenous groups were removed from native lands. An influx of immigrants followed and with them came deforestation, conversions of forest to farmland, and urbanization. One result of this was the increased dependence of the indigenous tribes on foods, medicines, education, and various other products derived from foreign environments (Hinojosa 1992). In order to arraign these needs indigenous tribes went pillaging into the forests to extract materials to produce craftworks to sell. The money attained for these products neither reflected the value of the resources for the times expenditure put into the production of the crafts.

In order to maintain the 121,876 square kilometers of the Ecuadorian Amazon, a plan was designed by the Departamento de Areas Naturales y Recursos Silvestres and the World Wildlife Fund that encompasses all the aspects of the problem: oil industry unplanned development, influx of immigrants, deforestation and conversion of forests to farmland, the expansion of human settlement, buying and selling of land by speculators posing to be settlers, and internal migrations of indigenous groups (Hinojosa 1992). It implemented a number of objective, policies, strategies, and programs to carry out the plan. Conservation, community training, forestry development, ethonobotany training, tourism management, wildlife harvesting and production, and research programs were all implemented.

Park guards along with technical and professional personnel keep close contact with indigenous tribes to resolve and defer disputes between the tribes and settlers. Education programs established at the community level offer tribes conservation priorities and guidance on environment issues, while settlers are offered alternate fashions to use tropical forests. Programs promoting natural remedies tap into the disintegrating indigenous knowledge of endemic plants. Tourism revolves around visits arranged by local travel companies and profits are funneled back into the reserve. Hunting, fishing, and gathering are all regulated throughout the park and research opportunities focus on the relationship between the people and the environment.

Through extensive planning, programs can facilitate the need of both humans and the environment. If properly used the earth has the ability to sustain each and every living organism. Resource greed is part of past trends, which must no longer persist, especially in the most diverse regions on the planet. Education is the primary factor at hand. It is thorough education that understanding of other cultures and practices can be integrated with processes of prolonged resource use for everyone, which is the ultimate goal of today's pressing issues.

Conclusion

Though it is small, the country Ecuador is filled with cultural and environmental diversity. Biological diversity abounds at every glance. Precious knowledge of indigenous peoples can be discovered in every forest and behind every tree. With past and present political restraints, much has been lost forever by extinction and loss of cultural heritage.

With recognition of these concerns, it is up to the generation of today to promote more sustainable forms of development. The consumption factor of modernization must be altered and general respect for the earth must be maintained and instilled in every human that resides upon the planet. While governments play a vital role in everyday life and the destruction of the environment, we have the ability to adapt to our surroundings and change our regulatory patterns. This earth supports our needs and desires. It is up to the human race to recognize the disturbance we have caused. Upon this recognition we must form new dreams of continued growth while respecting the livelihood of the planet. The earth gives us life, if humans hinder the ability of the earth produces and recreate then all is lost. The existence of our species, as well as others will be terminated. The earth will dispose of the human race if we neglect the natural of the environmental. The earth will dispose of the human race if we neglect the natural constraints of the environment. The earth will live on; it is up to us to decide if we want to dwell within.

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BOOK REVIEWS

THE SEVEN DAUGHTERS OF EVE

Sykes, Bryan, 2001

Review by Meadow Campbell

Bryan Sykes delves into the burgeoning world of mitochondrial DNA in his exciting book "The Seven Daughters of Eve." He uses a combination of first-hand experience and fictional narration to guide the reader on a journey from the discovery of mitochondrial DNA through his theory of the seven women to which the majority of Europeans can trace a direct maternal connection. The book is for an intermediate-level audience.

So as not to become too heavy, Sykes interlaces the technical language with amusing anecdotes. He continually relates his research in mitochondrial DNA to the real world. He discusses a variety of topics such as the Iceman found in the Alps, Tsar Nicholas II of Russia, Thor Heyerdahl and the peopling of the Pacific islands, the peopling of Europe, Asia, Australia, and the New World. He also talks about the designation of paleo-species, the disappearance of Neanderthals, the emergence of agriculture, Y-chromosome dating, initial migration out of Africa, and opposition to his findings. He does not leave anything out. The chapters read like a rack-list of hotly debated subjects in the discipline today. And, by adequately covering each topic, Sykes' provides the reader at several instances with a feeling of "Eureka," making new connections in the mind of the reader. Toward the end of the book Sykes devotes one chapter a piece to describing the lives of the seven mythical women he found to be the ancestors of the majority of Europeans. While the information is fictional, Sykes includes it to provide the reader with a means of imagining what life must have been like for each of these women. It fosters a personal connection with them, as there is a good chance that a European reader could trace a direct maternal link to one of Sykes' seven women.

While this technique accomplishes its literary goal quite well, the entire seven chapters are a bit far-fetched for an academic reader. Though he bases his fictional accounts on archaeological evidence and provides an amusing read, the reader should not take them literally. The redeeming quality of all that fiction is the last two chapters. Sykes admits there was nothing spectacular about each woman that made her stand out from the rest of her clan. That is, other than the fact that it was her genes, not those of her contemporaries, which survived through to modern populations.

One downfall of this book is the absence of a bibliography or citations. Though written for the masses, it still would have been helpful to have the opportunity to turn to the back for more sources. In a book which peaks the interest so well, it is unfortunate that Sykes does not provide the reader with a list of additional materials. Overall, this is a very stimulating book. The reader is drawn into the material. This, combined with the fact that the book is so well researched and well written, makes this a rather quick but fascinating read.

SPACE-TIME OF THE BORORO OF BRAZIL

Stephen Michael Fabian, 1992
Review by Audrey Ricke

Space-time of the Bororo of Brazil is an intriguing ethnography of the Bororo people written by Stephan Michael Fabian. Primarily through studying their knowledge of astronomy, he addresses the question of whether the Bororo have a way of determining how time passes. Fabian convincingly argues that the Bororo possessed a definite knowledge of space and time passage although they do not have the exact words to express this concept. Furthermore, this book is accessible to anyone with an anthropological background and those interested in culture and astronomy. The information in this book would be helpful in educating others about non-Western space-time concepts.

Fabian's primary point is to explain how the Bororo keep track of time. Environmental factors, such as the blooming of certain flowers, combined with certain astronomical features, such as Pleiades constellation, help determine when certain cultural events will be held. For example, Fabian reports that the funeral ceremony, the most important Bororo cultural event, is marked by the beginning of the rainy season and the appearance of Pleiades in the sky. In order to counter the monotony of scientific data, Fabian incorporates humorous anecdotes. One of these retold the Bororo's initial reaction to the idea of designating a specific date for the start of a season. The Bororo, who do not feel it necessary to name the days of the week, laughed at such a ridiculous idea. For them, natural indicators are much more suitable.

In addition, Fabian successfully demonstrates how the Bororo's observations of rotating patterns of constellations were incorporated into their social structure, namely their circular village layout. The amount of detail provided concerning the significance of the sun's and moon's heavenly position and the role of guards of the night, who are members of the tribe and notify the people of specific predawn times, convince the reader of Fabian's point. Moreover, the numerous charts, drawings, a few photographs, and a constellation foldout map included in this book aid the readers in understanding the Bororo's perception of time and space.

Since Fabian was involved in fieldwork with the Bororo, his major points develop out of his observations, but he uses the published sources to guide and support his conclusions. Both his bibliography and his footnotes are very com-

plete. Many of the sources were written by anthropologists who had previously done fieldwork with the Bororo or a neighboring tribe Fabian strongly indorses *Enciclopedia Bororo*, which was compiled by Salesian missionaries living amongst the Bororo. Furthermore, he lists in brackets additional readings that go more in depth on the subject that he is currently discussing while the foot-notes provide additional explanations of foreign words, which appear in the text.

Fabian's style is very straightforward and honest. He explains in the book's first chapters his objectives and provides background information about the Bororo culture. Throughout the rest of the book, especially in the last chapters, Fabian clarifies his points by restating them in a developing context. While his detailed-packed first chapters may seem overwhelming at first, Fabian rewards the reader with a sense of satisfaction in the final chapters when all of the information culminates in understanding. The logical and data-supported points culminate in a very enlightening and comprehensive conclusion.

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