A Critique of the Out of Africa Model

Michael Maystadt

Illinois State University

In the scientific community, there is a general consensus as to the origin and history of modern humans; most anthropologists agree that the earliest members of our species, *Homo sapiens*, emerged in Africa relatively recently and migrated to all parts of the earth. Stringer claimed that *Homo sapiens* only emerged in Africa. He based this on the fossil record, which showed that the oldest *Homo sapiens* fossils are from Africa. Mitochondrial DNA (mtDNA) lineage studies by Wilson, Cann and Stoneking in the late 1980's and early 1990's also reinforced this model. The Out of Africa model therefore states that all *Homo sapiens* evolved in Africa quite recently (circa 150,000 years ago) and replaced all other forms of the genus *Homo* with little or no interbreeding between the two.

Wolpoff has been a strong critic of the Out of Africa model; he claims that modern humans evolved in separate parts of the world and have been exchanging genes for hundreds of thousands of years. He cites contradictions in Stringer's argument such as the non-African appearance of early *Homo sapiens* fossils outside of Africa, and inconsistencies in the interpretation of mtDNA evidence. Templeton has also raised questions regarding the mtDNA evidence and what it actually shows. This paper demonstrates that there are significant inconsistencies between the Out of Africa model and all the available archaeological, fossil, and mtDNA evidence.

The conclusion reached is that the Out of Africa model is not a legitimate explanation for the emergence and subsequent spread of *Homo sapiens*.

Introduction

Around 150,000 years ago, a small group of hunter-gatherers roamed the African savannah. Included in this hunter-gatherer group were a man and a woman who ultimately became the maternal and paternal ancestors of every human living today. Modern geneticists have dubbed this couple "Adam and Eve".

In the simplest terms, this is the 'Out of Africa model'. I must admit that when I first heard everyone on earth was potentially descended from one male and one female, I was excited. I was only about 10 years old when my mother told me about the Out of Africa theory, and I really did not think about it again until I took a Paleoanthropology class last year.

When I began to read and examine some of the evidence, as presented by Chris Stringer (supporting Out of Africa) and Millard Wolpoff (supporting Multi-regional evolution and disputing Out of Africa), I became skeptical. I can't help that I am a very skeptical person by nature. So here is what the two theories claim.

The Out of Africa model for the emergence of modern *Homo sapiens* claims that humans only evolved in Africa and that modern humans moved out of Africa within the last 120,000 years. When humans encountered other species, (such as *Homo erectus* or *Homo neanderthalensis*) they did not interbreed with them, but rather slowly displaced them and eventually replaced them. That means that all modern humans can trace their ancestry from a small population that lived in Africa over 150,000 years ago.

The "multi-regional" model claims that modern humans can trace their ancestry back millions of years to local populations of *Homo erectus* that emigrated out of Africa almost two million years ago. Through

evolution and gene flow, eventually these populations acquired modern traits and emerged as *Homo sapiens*. In this model, modern humans may have emerged in Africa first (and there were no doubt multiple migrations out of Africa) but there was not an all out replacement of earlier archaic populations; rat researchers argue that certain "regional distinctions" stay intact through hundreds of thousands of year different geographical populations.

This indicates that local archaic populations may have made some contribution to modern human morphology.

In this paper, I ask several questions: Does all the available evidence prove or disprove the Out of Afric model?

Does the genetic evidence prove that all humans are descendants of one male and one female who lived almost 150,000 years ago?

Does the fossil evidence support a complete replacement of earlier forms of the genus *Homo*? If the Out of Africa model is correct, what was the huge advantage that modern humans possessed that allowed them replace *Homo erectus* and the Neanderthals so quickly and completely? After these questions are answered, I will assess if the Out of Africa model is a valid model for the emergence of modern humans.

The Out of Africa Model: The Fossil Evidence

Two categories of evidence point to Africa as the birthplace of *Homo sapiens*: fossil and genetic. Chris Stringer believes the fossil evidence shows anatomically modern humans living in Africa forwards of 150,000 years ago. He also believes that humans became modern in Africa first (2003:692-694). Six archaeological sites have produced fossils between 200,000 and 90,000 years old, which is crucial in proving that *Homo sapiens* were living in Africa far longer than they were living anywhere else (see figure 1).

From the Omo Basin in Ethiopia are two crania, labeled Omo I and Omo II. The Omo II skullcap represents a robust and archaic looking individual, but Omo I, though fragmentary, looks completely modern (see figure 2).

The modern traits that the Omo I skull display include long and curved parietal bones that shape the brain case, where the cranium reaches its maximum breadth, coupled with a short, broad face and high forehead. The prominent browridge tapers at the sides instead of forming a consistently thick bar as in more archaic humans.

The fragmentary face also lends clues to Omo I's modernity. The upper jaw, when pieced together, revealed

a modern looking, U shaped palate.

The lower jaw possesses a chin, and the few surviving teeth appear modern in size and shape (Johanson 1996:236). Originally dated to around 130,000 years old, recent dating has revised this date to 195,000 years old. This is the oldest anatomically modern human cranium known (Bower 2005:141).

The next oldest fossils come from Herto, also in Ethiopia. These fossils represent a "transition population," one that is almost anatomically modern but retains some archaic attributes (see figure 3). Modern features this population possesses include less prominent browridges and high cranial vaults. These fossils have been dated to around 160,000 years old, making them some of the oldest "near modern" specimens discovered (Stringer 2003:692-694).

The Klasies River Mouth, located near the southern tip of South Africa, produced fossils tentatively dated to 120,000 years old.

Unfortunately, the remains are highly fragmentary, and have given rise to a great debate concerning their modernity (see figure 4). They are quite *Homo sapiens*-like, but whether any or all of these fossils represent our species still awaits definitive classification (Tattersall 2001:226).

From the same area of South Africa comes the Border Cave site, which produced some unarguably anatomically modern specimens.

Although there is the possibility that this specimen was an intrusive burial, the Border Cave I skull may be anywhere from 75,000 years old up to 100,000 years old (Johanson 1996:44; Tattersall 2001:226) (see figure 5). With the Klasies River Mouth fossils and the Border Cave fossils taken together, there is potential evidence for modern *Homo sapiens* living in South Africa between 100,000 and 120,000 years ago.

Another very important fossil find comes from the extreme northern tip of Africa, from present day Morocco. The site named Jebel Irhoud produced two modern looking human craniums. The Jebel Irhoud I fossil still retained very robust and archaic features, such as a heavy browridge, but the skull was close to being modern in morphology (see figure 6).

Although the date is contested, the Jebel Irhoud site may date anywhere between 100,000 and 200,000 years old (Johanson 1994:235-236; Tattersall 1995:182).

The last important site is Jebel Qafzeh, which is located just north of Africa in present day Israel. Many anthropologists think that this site provides direct evidence of a migration 'out of Africa' around 90,000 years ago (Tattersall 2001:252) or 120,000 years ago (Oppenheimer 2003:54-55). Two near complete crania, Qafzeh 6 and 9, show very modern morphology in most or all respects (see figure 7 and 8). Qafzeh 6

is archaic looking in some attributes, but Qafzeh 9 is a prototypical *Homo sapiens* skull (Johanson 1994:236; Tattersall 2001:252).

With all the fossil evidence examined together, Stringer concludes that modern humans emerged in Africa and only in Africa. "Africa is not just the best source; it's the only source for fossils exceeding 100,000 years old that show a blend of primitive and incipient modern human features" (Johanson 1994:243).

The Genetic Evidence

Other evidence also points to Africa as the original homeland of modern humans. In the late 1980's new techniques of molecular analysis began to have a significant impact on answering the questions of human origins.

Mitochondrial DNA (or mtDNA) was looked at as an excellent way to infer ancestral relationships. MtDNA has five attributes that make it particularly useful.

First, it lacks the elaborate self-repairing mechanisms of nuclear DNA; this means mtDNA accumulates mutations at a much higher rate, giving molecular systematists lots of differences to look for, even in closely related populations.

Second, it is largely free of the "junk" DNA that composes so much of the nuclear DNA complement. Third, modern human mtDNA consists of about 16,500 nucleotides. This is in contrast with more than three billion nucleotides in the human nuclear DNA genome – obviously using mtDNA simplifies comparisons. Fourth, mtDNA is always transmitted between generations as a single unit, unlike the nuclear DNA that is carried on chromosomes that sometimes exchange material. Finally and most importantly, mtDNA is only inherited from the mother (Tattersall 2001:228-229).

Using representatives from a number of geographical populations, Allan Wilson, Rebecca Cann, and Mark Stoneking sought to discover the original homeland of modern humans. Studies conducted in 1987 and 1991 found that all people on earth probably have ancestral roots in Africa. Populations in Africa have the most mtDNA diversity and the most acquired mutations (indicating ancient roots, more ancient than Europeans or Asians) and the "family tree" constructed seemed to have its actual roots in Africa (Tattersall 2001:229; Cann et al. 1987:31-36).

Steven Oppenheimer also claims that humans evolved and subsequently migrated out of Africa using genetic evidence.

Oppenheimer (2003) built on the prior genetic work of Wilson, Cann, and Stoneking, and used the mtDNA

evidence not only to construct mtDNA trees, but to also infer when and where migrations of the past took place (see figure 9).

For example, the mtDNA tree constructed by Oppenheimer shows that the maternal ancestor of all living humans was a woman named "Mitochondrial Eve" who likely lived 190,000 years ago (Oppenheimer 2003:365).
"Mitochondrial Eve" had two daughters, one that founded all the mtDNA lineages inside of Africa, and one that founded all mtDNA lineages outside of Africa; the latter woman is referred to as "Out of Africa Eve" (Oppenheimer 2003:368-369). Therefore, all non-Africans are descendants of "Out of Africa Eve" (see figure 10).

Oppenheimer claims that the first migration out of Africa was through a Northern corridor into present day Israel and the Middle East, at around 120,000 years ago (Oppenheimer 2003: 53-54). (Jebel Qafzeh may represent the fossil evidence for this migration.)
Oppenheimer believes that this 'northern exodus' was unsuccessful, and that this population was not ancestral to modern Europeans, as some have theorized. Rather, Oppenheimer states that a dramatic climatic shift trapped these people in the Middle East (sandwiched between the Sahara desert and the glaciers of Europe), and that they eventually died out around 90,000 years ago (Oppenheimer 2003:55-56).

Oppenheimer suggests that a second "out of Africa" migration took place around 70,000-80,000 years ago through the Red Sea, which separates Ethiopia and east Africa from Asia and the Middle East. He believes these people built small rafts to float across the Red Sea, which at times of maximum glaciation was only seven miles wide (2003:73). After getting across to the Arabian Peninsula, they may have reached India and parts of Southeast Asia via a coastal route, using boats (Oppenheimer 2003:156-157). Eventually, people began to migrate to and settle Papua New Guinea around 77,000 years ago (2003:165), and Australia around 70,000 years ago (2003:161). Oppenheimer thinks that the Lake Mungo people from Australia, who represent a gracile modern human population, may indeed be the first Australians. Recent dating of these fossils indicates they may be as old as 62,000 years old. The genetic evidence also indicates that Australians and New Guineans mtDNA lineages can be traced back to Africa, and there is absolutely no evidence that these people ever interbred with *Homo erectus* (2003:159). It is also important that Australians and New

Guineans, according to Oppenheimer, were not part of the same migration event; rather, there are no shared clans between Australians and New Guineans, and the New Guineans are as genetically distant from Australians as they are from any other non-African people (2003:164). Between 60,000 and 70,000 years ago, there was also a population explosion outside of Africa, indicated by a number of differentiated mtDNA lineages arising (2003:368-369).

What caused this population boom is unknown, but it had to occur in order to "give birth" to so many different mtDNA lineages.

Sykes is another geneticist who claims that all modern humans can trace their ancestry back to Africa (see figure 10).

Sykes uses primarily mtDNA evidence to make his case, but also devotes an entire three pages (2001:111-113) to address the fossil record in China, Europe, and Africa. According to Sykes there is a "sensible progression" from earlier forms to more modern forms in Africa, but this progression is lacking in all other areas: "There are no signs of any more primitive, intermediate fossils anywhere outside of Africa" (2001:111). Later this statement will be proven to be incorrect.

Sykes proved through mtDNA evidence that the Cro-Magnons (the first modern human inhabitants of Europe), and the Neanderthals (a locally adapted *Homo erectus* population that inhabited Europe during the last Ice Age) did not interbreed.

The Neanderthal mtDNA lineages made no contribution to modern lineages (2001:126-127).

Sykes even admitted in his book that he was not only surprised but also disappointed: he expected to find at least some remnants of mitochondrial DNA from the Neanderthals. Sykes admits, "If the interaction between Neanderthals and Cro-Magnons resembled more recent historical encounters between new arrivals and the original inhabitants of a territory, then we might expect matings between Cro-Magnon males and Neanderthal females" (2001:126).

Although he has sequenced mtDNA from over 6,000 living Europeans, there is not one that could be a credible descendant of a Neanderthal.

He suggests that perhaps Neanderthals and Cro-Magnons could not successfully produce viable offspring, owning to a difference in chromosomal numbers (2001:126-127). In Europe, genetics demonstrate there was complete replacement of Neanderthals with absolutely no interbreeding.

Problems with the Out of Africa Model: The Other Fossil Evidence

Although the evidence presented above would appear to portray the Out of Africa Model as an airtight case for modern human origins, other evidence directly disagrees with this theory. The same evidence that strengthens the Out of Africa model (fossil and genetic) also weakens it in many respects.

The fossil evidence from the rest of the world (mainly China, Southeast Asia, and Australia) presents some problems for the Out of Africa model.

One of the sites that provides good evidence of "archaic looking" modern humans comes from Dali, China. The Dali cranium may be the best candidate for a modern human outside of Africa, and is estimated to be 209,000 years old (see figure 11). In certain attributes, it is very *Homo erectus* like: it possesses a low, long, and thick walled cranium with a very thick browridge over the eyes. The rugged nuchal region at the rear of the cranium has a prominent torus, and on the top of the cranium is a slight sagittal keel. In other attributes, Dali is unlike *Homo erectus* and more similar to modern *Homo sapiens*: it has a larger cranial capacity (1120 cc) than older *Homo erectus* crania from China.

Dali also possesses a flat face and prominent cheekbones, features very common in the modern Chinese (Johanson 1996:234-235).

Another fossil, from Jinniushan, China, also provides evidence for possible modern human habitation outside of Africa at a date before the birth of "Eve."

Although the geologic age of Jinniushan is disputed, this cranium is at least 200,000 years old, and could potentially be as old as 280,000 years old. Very similar to Dali, Jinniushan also shows a blend of *Homo erectus* and *Homo sapiens* anatomical features (see figure 12). Jinniushan differs from Dali in possessing less robust browridges, a less robust occipital torus, and a larger cranial capacity (1400 cc), a capacity that is in the range of modern *Homo sapiens*.

This specimen also possesses a delicate facial skeleton, and the overall facial morphology looks very modern (Chen et al. 1994).

Another important fossil from China is the Liujiang skeleton, which represents a modern *Homo sapiens* (see figure 13).

By both modern and Neolithic standards Liujiang has a long and low cranial vault; it also possesses an occipital bun at the rear of the head, and there is no sagittal keel present. The facial skeleton is also short but relatively broad for its height (Wu and Zhang 1985:107-133). Relying on its resemblance to well-dated fossils from Japan, scientists assigned this *Homo sapiens* skull an age of 20,000 to 30,000 years old. Recent

dating has revised this date to at least 68,000 years old. However, the Liujiang fossil may have come from sediments that date from 111,000 to 139,000 years ago. *Homo sapiens* teeth found at two other caves in this region come from sediment that has been dated to at least 94,000 years ago. The presence of modern humans in this part of the world 100,000 years ago or more would roughly coincide with the earliest fossil dates in Africa and the Middle East (Shen et al. 2002:817-829).

Other contradictory fossil evidence comes from Southeast Asia and Australia. Alan Thorne thinks that specimens from this part of the world show evidence of an 'Out of Java' sequence; fossils seem to indicate that certain morphological features persist from *Homo erectus* fossils in Java right up to modern *Homo sapiens* fossils found in Australia (Johanson 1994:219).

The first fossil in this sequence comes from Sangiran, Java. Although this specimen clearly represents a *Homo erectus* individual from roughly 700,000 years ago, it is valuable in two ways. First, it is the only *Homo erectus* specimen from Java that has the face preserved (see figure 14). Secondly, Sangiran 17 possesses anatomical traits that are present in some modern *Homo sapiens* specimens from the same region.

These traits include a relatively flat frontal bone; a projecting face with massive, flat cheekbones; a distinct ridge at the base of the cheekbone; a rounded edge to the bottom of the eye sockets; and a lack of clear demarcation between the nasal region and the lower face. Sangiran also possesses a much higher cranial capacity (1029 cc) than is usually expected of *Homo erectus* specimens of this date (Johanson 1996:191).

Additionally from Java come a number of adult crania from the site called Solo (also known as Ngandong) (See figure 15). Although these crania are sometimes regarded as a late-surviving variant of *Homo erectus*, Wolpoff (1980:219-220) disagrees that they represent *Homo erectus*: these individuals have much larger cranial capacity than other *Homo erectus* specimens from China and Java, indicating a trend toward modernity. The crania are also distinctly different from other *Homo erectus* specimens in being much taller and straight sided.

Although dating has showed that these crania may be as young as 40,000 years old (Tattersall 2001:162-163), Wolpoff thinks that they are considerably older than that (1980:219-220).

The last fossils from the so-called "Out of Java" sequence are from the Kow Swamp in southern Australia. Interestingly enough, the Kow Swamp

fossils date to only about 10,000 years ago (See figure 16 and 17). These fossils represent a very robust population that possesses heavy browridges, large teeth, and thick cranial bones. Again, this population

possesses features that are common in both older Southeast Asian fossils (perhaps indicating a distant ancestry) and modern Australian aborigines. Although the unique shape of the craniums of the Kow Swamp fossils (particularly Kow Swamp 5) may show signs of a cranial deformation, this has never been proved conclusively. Interestingly enough, the Kow Swamp fossils, which are very archaic or transitional in appearance, date to only about 10,000 years ago (Wolpoff 1980:327-330). The appearance of archaic *and* modern features in this population, along with features that were present in Java and Southeast Asia for over 500,000 years, is very hard to reconcile with the Out of Africa replacement model.

The "Other" Genetic Evidence

Various problems have also been cited with regard to the mtDNA evidence and what it actually shows.

Alan Templeton has been a strong critic of the Out of Africa genetic evidence, and claims that the original mtDNA lineage dates found in 1987 and 1991 may have been incorrect by an order of magnitude (Johanson 1994:245).

The model proposed by Alan Templeton is dominated by genetic interchange and a special role for Africa. More recently, population expansions out of Africa acted to extend the geographical range of the human species and to establish additional areas linked by gene flow. Templeton's model emphasizes that genetic interchange among human populations, facilitated both by gene flow and range expansions coupled with interbreeding, has been a major force in shaping the human species and its spatial pattern of genetic diversity (2002:45-51) (See figure 18).

Templeton theorizes that there were at least two major movements of people out of Africa after the original spread of *Homo erectus.*

Many 'modern' traits (such as high, rounded skulls; small browridges; a vertical forehead; and a noticeable chin) first appear in Africa about 130,000 years ago, followed by an expansion out of Africa more than 90,000 years ago.

This time frame overlaps extensively with the out of Africa expansion marked by the mtDNA and Y chromosome distributions, implying that many of these traits could have been carried into Eurasia by this African population's range expansion. Other traits, however, do not display any significant changes before, during or after this most recent expansion out of Africa. This later set of traits is difficult to reconcile with a population replacement, but is compatible with this most recent out of Africa expansion event being characterized by interbreeding (Templeton 2002:45-51).

The predicted large genetic impact of African populations explains the results of Takahata et al. that about 90% of the haplotype trees in the nuclear genome appear to be rooted in Africa. These results also falsify a total replacement hypothesis, which predicts that all haplotype trees with coalescent times greater than 100,000 years must be rooted in Africa.

All of the haplotype trees considered have expected coalescent times greater than 100,000 years, so 100% of such old trees should have African roots under complete replacement, and not the observed 90%. According to Templeton, humans expanded again and again out of Africa, but these expansions resulted in interbreeding, not replacement, and thereby strengthened the genetic ties between human populations throughout the world (2002:45-51).

My Research: The Impact of Genetic Bottlenecks

It is my belief that certain "events" in the past may have clouded the mtDNA picture even more. While geneticists are quick to point out how similar we all are in terms of mtDNA and Y chromosome types, I highly doubt this "similarity" has always existed in modern humans. I have many reasons to suspect this.

Many events in the past may

have led to dramatic bottlenecks that have decreased mtDNA and Y chromosome diversity within a given population.

A bottleneck is a severe reduction in the population size of a group in a relatively short amount of time. As Wolpoff states, "decreasing populations stand an excellent chance of losing mtDNA lineages" (1997:305). I think that these bottlenecks are the key to understanding why mtDNA diversity (or lack of diversity) exists today.

Throughout history, disease has been a monumental selective pressure on human populations, and has created drastic bottlenecks.

The Bubonic or "Black" Plague devastated the European population during the middle ages. This plague began to ravage the European continent in 1347 (Gottfried 1983:37), and had reduced the population significantly by 1351. Morbidity from the plague may have ranged between 25-45%. In 1351, agents for then Pope Clement VI calculated the number of dead Christians to be 23,840,000. With a pre-plague population of around 75,000,000, the Pope's figure shows morbidity to be roughly 31% (Gottfried 1983:77). During the plague and the ensuing bottleneck, many mtDNA and Y chromosome lineages were doubtlessly lost. Currently,

modern Europeans can trace their mtDNA to seven different mtDNA lineages, and 45% of Europeans belong

to the same lineage (Sykes 2001:196). (I will mention later why the 45% is important.) Whether this bottleneck destroyed lineages that were older than existing mtDNA lineages in Europe or destroyed mtDNA lineages that contained Neanderthal mtDNA types is debatable. Research of the actual bones and mtDNA of plague victims would probably yield the definitive answer.

Colonization of indigenous populations also creates population and genetic bottlenecks, and, in some rare cases, leads to the complete extermination and extinction of an indigenous population (the aborigines of Tasmania and the Tehuelche of Tierra del Fuego, South America are good examples of this) (Oppenheimer 2003:267 and 205-206). The colonization of the New World by Europeans also created a large bottleneck in the existing indigenous population.

In fact, much has been made concerning how genetically similar all Native American groups are, and how these groups can be traced back to a small founding population of East Asians. Oppenheimer calls the first Americans "clones" from a single Asian tribe (2003:321). However, I believe that the conclusions made about the ancient inhabitants of the New World are very shaky for a couple reasons.

To begin, I do not believe that the modern mtDNA (or the Y chromosome data, for that matter) of Native Americans is a true representation of the genetic diversity that existed in the past. I suspect that much more diversity existed in the "pristine" population before the drastic bottleneck that the European colonization caused.

Disease was one major factor that significantly reduced the aboriginal population of North America. The first pandemic of smallpox, which lasted from 1520-1534, may have reduced the aboriginal population of North America by as much as 75% (Jaimes 1992:31). Further diseases, along with massacres and warfare, reduced the North American pre-contact population of 18 million to around 330,000 in the year 1900. This would indicate an overall attrition of over 99%.

Other estimates range from 66-95% overall attrition for the native populations of North America (Jaimes 1992:37).

The population sizes of modern Native American tribes also betray their pre-contact numbers. Certain groups that were "small" during pre-contact are now "large". For example, the Sioux (represented by the Lakota, Dakota, and Nakota combined), whose pre-contact population was no larger than 35,000 in 1700, had increased to 78,588.

Similarly, the Chippewa, who may have numbered upwards of 40,000 in pre-contact times, had a population of 73,491 in 1980.

The Navajo (or Dene), who did not number larger than 8,000 in 1680, had grown to 158, 633 in recent times (Jaimes 1992:38).

Other Native American groups who were “large” in pre-contact times are now “small”. The Eastern Shawnee, at their height probably had a population of 50,000. In 1980, only 355 Eastern Shawnee were alive.

The Deleware, who also numbered around 50,000 before contact, had a population of only 989 in 1980. The Mandan, still at least 15,000 strong after army-induced smallpox had ravaged their tribe, numbered only 1,013 individuals in 1980. The Peorias, who at their height numbered 20,000, numbered only 355 in 1980. The implication of this information is clear: Native American groups have drastically changed since the European colonization.

Any genetic studies that involve Native American groups must keep the historical factors mentioned above firmly in mind before making grand conclusions about the past genetic history of these people.

During this great bottleneck caused by the European colonization, many mtDNA and Y-chromosome lineages doubtlessly became extinct.

This extinct mtDNA could provide alternate points of origin for modern Native Americans. It is important to remember that although modern Native Americans may not have this ancient mtDNA, they may still carry the nuclear DNA of their distant kin.

Future genetic testing on Native American remains will hopefully answer this question.

Also, it is clear from the fossil evidence that the earliest inhabitants of the New World were not all “clones of a tribe from East Asia”. The discovery of Kennewick Man on the Northwest Coast of the United States

provided direct evidence of what some of the early Native Americans (from around 10,000 years ago) looked like.

Kennewick Man possessed Sundadont teeth (unlike the teeth of East Asians and modern Native Americans, which are Sinondont and shoveled), and his eye sockets were unlike those of modern Native Americans. Instead of resembling his supposed East Asian ancestors, Kennewick Man closely resembled modern populations such as the aboriginal Japanese (the Ainu) and the Polynesians. Unfortunately, Kennewick Man’s mtDNA could not be extracted due to contamination (Oppenheimer 2003:316).

Other early Native American fossils that are not particularly East Asian looking include Spirit Cave

Man (9,400 years old), Pelican Rapids Woman (7,800 years old), Browns Valley Man (8,900 years old), and Buhl Woman (10,800 years old) (Oppenheimer 2003:322). Oppenheimer dismisses these fossils, calling them "atypical" of Native American fossils of the period. Regardless of their atypical appearance, the fossils discussed above prove that not all early Native Americans had ancestors who were East Asians: rather, it seems that the New World

was in the past inhabited by a number of very distinct groups that had many points of origin.

What Advantage Did Modern Humans Have?

If the Out of Africa model for the emergence of *Homo sapiens* is true, then what was the huge advantage that allowed modern humans to so easily replace the Neanderthals in Europe and *Homo erectus* in China and Southeast Asia?

A few of the examples often cited by paleoanthropologists and geneticists include behavior (burial, symbolism, jewelry, etc.), technology (tool kits), language, and biology (adaptive advantages).

One often cited epiphany or benchmark of human behavior involves specific behaviors related to burials, jewelry, and art.

Around 40,000 years ago, there was a cultural explosion in which jewelry, art, and elaborate burials suddenly became commonplace all across Europe.

These attributes indicate that for the first time in history, anatomically modern humans started to *behave* and *think* like modern humans.

However, there are some examples of primitive art and jewelry associated with Neanderthal sites. From the French site of Pech de l'Aze, scratched lines were found on an ox rib that *could* be called symbolic (Shreeve 1995:267-269). There are also examples of Neanderthals taking special care at burying their dead, as evidenced by the "flower burial" at Shanidar, Iraq, and a burial at Teshik-Tash, Uzbekistan, in which an adolescent was buried with a ring of ibex horns (Tattersall 2001:215-217). Although modern behavior is synonymous with the Upper Paleolithic and associated with modern humans, it is clear that early forms of modern behavior were present in Neanderthals.

Are tools the key to understanding the modern human advantage over *Homo erectus* and Neanderthals? The evidence suggests otherwise.

The archaeological record indicates that there was nothing advanced or cutting-edge (no pun intended) about the modern human tool kit until around 40,000 years ago. Modern or "near modern" sites from the middle

east, such as Skhul and Qafzeh (circa 90,000-100,000 years old) show that modern humans were still using the Mousterian tool kit, and that their tools were indistinguishable from the tools that Neanderthals were using (Shreeve 1995:267-268). Archaeological sites in Africa show that modern humans were using Middle Stone Age tools (synonymous with the Mousterian tool tradition) until 30,000 years ago (Oppenheimer 2003:98). The tool kit from Southeast Asia and China
is equally puzzling (it is actually backwards), with more modern-looking tools appearing *before* more primitive tools (Oppenheimer 2003:100).

Perhaps the most controversial (and the most popular) evidence for a "modern advantage" may be attributed to language. The ability of modern humans to use and understand language (and the inability of *Homo erectus*
and Neanderthals to successfully use and understand language) is often cited as the prime attribute that gave modern humans the decisive edge in the evolutionary race.

The language model claims that human language came about in the Upper Paleolithic, and was responsible for the tremendous cultural innovations that quickly swept through Europe and the rest of the world. In fact, this theory is a major point of *agreement*
between paleoanthropologists, geneticists, and archaeologists (Shreeve 1995:272). But is this a valid model?

Most experts claim that humans could talk (and others couldn't) for three main reasons: *Homo erectus* and Neanderthals lacked modern hyoid bones (which is involved in vowel sound production), modern humans possessed a uniquely "flexed" skull base (which positioned the larynx lower down in the throat, leading to increased language and sound producing ability), and modern humans possessed unique "language centers" in the brain (represented by Wernicke's area and Broca's area), which *Homo erectus* and Neanderthals both lacked.

The hyoid bone argument was widely accepted until a Neanderthal hyoid was discovered in the "Moshe" skeleton discovered at Kebara (Shreeve 1995:272-273). Neanderthals were also thought to lack the flexed skull base that is vital to modern human speech, but recent re-analysis of Neanderthal crania have demonstrated their skull bases were flexed to a "modern" extent. Certain modern human skulls from the middle ages also indicate that some human skull bases are not flexed to a great degree. This indicates that

there may not be a strong correlation between flexed skull bases and language ability (Shreeve 1995:273).

The last attribute cited by the language advocates is actually the weakest of the three. According to Ralph Holloway (who is a leading authority on ancient hominid brain structure), Broca's and Wernicke's areas are present in hominid skulls dating back millions of years, associated with *Homo habilis*. Holloway has also shown that *habilis*

skulls reveal cerebral asymmetry and left-hemisphere lopsidedness, which is associated in our species with language (Shreeve 1995:274:275).

Whether Homo habilis could talk or communicate is very debatable, but it is clear that *habilis* possessed some of the key ingredients needed for speech.

I doubt the language argument based on the physical evidence and on my own knowledge of language. To start, I am fascinated by our closest primate relatives (the Chimpanzee and the Gorilla) who, under careful guidance, show an almost mastery of modern human language. Under careful guidance and direction, chimps and gorillas show that they can understand human spoken language, master sign language, and can even learn an artificial language by using a set of symbols that are linked to a computer (Yule 1996:31-33). My point is this: why do we (humans) embrace chimps and gorillas as being "so much like us", yet dismiss *Homo erectus* and Neanderthals as "being so different"?

If chimps and gorillas can master language (with their small brains and un-developed language centers) why then do some scientists assume that Neanderthals and *Homo erectus* could not? It is my firm belief that Neanderthals and *Homo erectus* could talk and did talk. Whether modern humans could talk *more effectively* than *erectus* or the Neanderthals is debatable and ultimately un-provable.

If modern humans did not possess an advantage in the three areas listed above, then what was the advantage they possessed?

Perhaps it was the mere fact that they lived slightly longer lives than the Neanderthals (and perhaps *Homo erectus*); if modern humans' mortality rate was just slightly lower than the Neanderthals, the latter would have faded peacefully into mathematical oblivion in a single millennium (Shreeve 1995:72).

This is the popular theory proposed by Ezra Zubrow, which suggests that modern humans did not have to physically kill off the Neanderthals, or even be smarter or do anything better than the Neanderthals in order to exterminate them; they simply had to live slightly longer lives. If they did live slightly longer, the

Neanderthals would become extinct quite quickly, in only a few thousand years. I believe that this theory is the most logical explanation for what may have happened in Europe (and possibly around the world) when modern humans encountered their other hominid cousins. But even *deliberate* modern human genocides in Nazi Germany (against the Jews) and North America
(against the Native Americans) have failed to completely exterminate one ethnic group of humans. Maybe the Neanderthals and *Homo erectus*
aren't really extinct: perhaps they are still among us, still very much alive in our morphological features and subtly present in our genes.

Conclusion

Does the evidence prove that all humans originated in Africa from a small population of hunter-gatherers that lived over 150,000 years ago? Not exactly: while the Out of Africa model does incorporate *certain*
fossil, genetic, and archaeological evidence, the same categories of evidence also prove the complete opposite. Humans *seem*
to have certain morphological features that were around hundreds of thousands of years ago, indicating that the complete replacement endorsed by the Out of Africa model could not have been *complete*. Genetic evidence also demonstrates that certain blood traits and even the mtDNA evidence do not consistently fit the Out of Africa model. Archaeological evidence also indicates that complete replacement probably did not take place. Why then, does the "Out of Africa" model continue to be so popular and widely accepted today ?

The Out of Africa model as it exists today has been the widely accepted theory since geneticists Allan Wilson, Rebecca Cann, and Mark Stoneking first published their findings in 1987. They even "mistakenly" named the mitochondrial ancestor of all humans "Eve" after the first known woman mentioned in the Biblical book of Genesis.
This "accident" involving the name of Eve instantly implied that all humans came from one female (and possibly one male).
The press even played into this biblical link between the bible and genetics by further reinforcing the "Adam and Eve" model. The problem was, many people *did not* and *could not* grasp what the Out of Africa and Eve model really meant or signified. Just because all humans are descended from one male and one female *does not* mean that there was *at anytime in the past*

only one human male and female living (this is the part that got me hooked when I was 10, with my mom implying that there was in fact only an "Adam and an Eve" that were the ancestors to all humans). Most likely, "Adam and Eve" lived in a population that may have numbered in the thousands, but the other Y-chromosome and mtDNA lineages that existed thousands of years ago have been lost throughout time; only one of each remains in the human species today.

When first presented in 1987, the Out of Africa model was new, modern, and told humans about their distant origins. This model was simple and made science reporting easy and fun. The new Out of Africa model implied the brotherhood of all humankind and was politically correct. It was idealistic, and too good to be true (Wolpoff 1997:43-44). The Out of Africa model is and was so popular because people *wantedt* it to be true.

This thesis has demonstrated that the Out of Africa model is most likely not the correct model of modern human origins.

What the Future Holds

What will the future hold for Paleoanthropologists and Geneticists? I hope it will bring more teamwork between these two professions, but I doubt that this will happen any time soon. Paleoanthropologists and Geneticists, in general, have differing philosophies on the presentation of their evidence. Geneticists deal with one thing: genes.

They do understand evolutionary theory, but they explain it in a way that is especially foreign to the paleoanthropologist.

I have a problem with the way that some Geneticists (at least the ones that have published Out of Africa material that I have read) present their evidence. The problem I have is the "house of cards" that Geneticists are building on top of the existing Out of Africa model, whose foundation I would say is not stable. I suggest that some Geneticists are getting ahead of themselves and the Out of Africa model itself. In fact, most Geneticists proceed with their mtDNA or Y-chromosome with the belief that the Out of Africa model is airtight, firm, and secure. "Out of Africa is secure", says Oppenheimer (2003:352). Both Stephen Oppenheimer and Bryan Sykes present excellent evidence regarding human migrations based on mtDNA and Y-chromosome studies, but neither addresses the fossil record particularly well. Why? *The reason is geneticists don't deal with fossils.* Most actually dismiss the fossil evidence completely, as if the fossils belonged in a museum of curiosities, things that are fun to look at but serve on useful purpose. In fact, they

are only useful when they fit the model that a geneticist is trying to promote. In the future, both sides must work together to present accurate theories and models of human evolution.

In 1859, Charles Darwin said, "Light will be thrown on the origin of man and his history" (488). Light has definitely shone on the origin of man, but I do not believe that the question of human origins has been answered by the Out of Africa model.

In the future, hopefully we will learn the complete history and the origin (or origins) of humans; but we still have a long way to go.

Thesis Bibliography

Bower, Bruce
2005 "Human Fossils are Oldest Yet"
Science News 167(Feb. 26):141

Cann, Rebecca L., Mark Stoneking, and Allan C. Wilson
1987 "Mitochondrial DNA and Human Evolution"
Nature 325 (Jan 1):31-36

Chen T, Yang Q, and Wu E
1994 "Antiquity of *Homo sapiens* in China"
Nature 368:55-56.

Darwin, Charles
1859 On the Origin of Species. Cambridge: Harvard University Press

Gottfried, Robert S.
1983 The Black Death: Natural and Human Disaster in Medieval Europe. New York: Free Press

Jaimes, Annette M. Ed.
1992 The State of America: Genocide, Colonization and Resistance. Boston: South End Press

Johanson, Donald, and Blake Edgar
1996 From Lucy to Language. New York: Simon and Schuster.

Johanson, Donald, with Lenora Johanson, and Blake Edgar.
1994 Ancestors: In Search of Human Origins. New York: Villard Books

Oppenhiemer, Stephen
2003 The Real Eve. New York: Carroll and Graf Publishers

Shreeve, James
1995 The Neanderthal Enigma. New York: William Morrow and Company

Shen, G., W. Wang, *et al*.
2002 "U-series dating of Liujiang hominid site in Guangxi, Southern China" *Journal of Human Evolution* 43(Dec. 1):817-829.

Stringer, Christopher
2003 "Out of Ethiopia"
Nature 423:692-694

Sykes, Brian
2001 The Seven Daughters of Eve. New York: W. W. Norton and Company

Tatersall, Ian
1995 The Fossil Trail. New York: Oxford University Press

Tatersall, Ian and Jeffrey Schwartz
2001 Extinct Humans. Boulder, Colorado: Westview Press

Templeton, Alan.

2002 “Out of Africa again and again”
Nature 416:45-51

Wolpoff, Milford H.
1980 Paleoanthropology. New York: Alfred A. Knopf

Wolpoff, Milford H., and Rachel Caspari.
1997 Race and Human Evolution. New York: Simon and Schuster

Wu, X. and Zhang, Z.
1985 “*Homo sapiens* Remains from Late Palaeolithic and Neolithic China”
In R. Wu and J. W. Olsen, *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, pp. 107-133. Academic Press, London.

Yule, George
1996 The Study of Language. Cambridge: Cambridge University Press