

# Effects of Ecology and Climate on Human Physical Variations

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There are several factors influencing human diversity and observable inherited variations in physical appearances. Observable physical traits

are passed on along generations by genetic exchange of reproduction. Physical adaptability to climate shifts and changes in human populations following migrations to different climates is the primary reason for the variations. There were many different paths taken by our early ancestors from out of Africa and into Asia, Europe, the South Pacific and the Americas. Effects on resident indigenous populations are further complicated by the recent form of migration called colonialism.

When discussing observable human physical variations the most common factor is skin color, or degree of melanin present in a person's skin. Misconceptions about specific "races" of people result in skin color hues being assigned on a generic basis; red, yellow, brown, black and white are the common sociological terms used by western society when describing a person's "race." The corresponding ethnic and geographical regions are assigned for each color-coded "racial" group; red = Native North American Indian; yellow = "Oriental" or East Asian; brown = any mixed race Individual such as "Indian" South Asians" and "Latinos"; black = African and aboriginal Australian; white = Northern (sometimes Southern) European. This rather inaccurate, limiting and confusing method of racial categorization by social "scientists" misses several key factors when relating to humans and their physical appearances based upon their places of origin. While certain generalizations of physical features and place of origin may be true, there are several areas of overlap and diffusion where the boundaries are blurred and a clear distinction cannot be made between "races" by looking at appearance alone. It would be more accurate to describe variations in skin color as predictable inherited adaptations to regional conditions over time of several generations rather than specific "races."

Geography and ecosystem responses to climactic shifting are the primary reasons for variation of apes, hominids and other human ancestors. Looking backwards along the evolutionary family tree of modern Homo sapiens to an unspecified beginning point can help with understanding the importance of geography, climate and ecological habitat to the formation of modern human's physical features and variations of complexion. The origin point for modern humans is vague enough, and starting with the common ancestor of gorillas, chimps and apes can begin a mystery of exhuming fossils trapped in sediment layers of the two rift valleys of Africa. The long-term changes in ecological habitats brought about by geological rifting appear a central factor in most early evolutionary adaptations. Most paleoanthropological studies focus on the East African Rift Valley, though the Western Rift Valley from Zaire-Uganda border south past Rwanda & Burundi into Lake Tanganyika also has ancient sediments with fossil remains (Boaz, 64). Unlike the Eastern Rift, the Western Rift retained most of its vegetation cover due to the greater seasonal rainfall amounts of Western Africa (Boaz, 65). It is believed that the split from ancestors of gorillas/chimpanzees and human ancestors occurred around 8 million years ago around the time of the Western African Rift Valley habitat vegetation changes (Boaz, 67). Although the Western Rift Valley retains vegetation cover, there was a significant change in the type of vegetation present and primates needed to adapt themselves as a result. Another

hypothesis is that gorillas differentiated from chimps and human ancestors as the African climate became more arid, the gorillas climbed up wetter mountain slopes to access lush vegetation. The mountain slopes also had colder temperatures and gorillas evolved a larger body size as seen in northern temperate climate mammals (Boaz, 68). The differences between gorillas and chimps are then largely determined by the type of ecosystem they inhabit. Gorillas live in dense forests with substantial rainfall, while chimps live in open savanna ecosystems with clumps of trees between grasslands (Boaz, 73). The chimp habitat is intermediate mixed boundary of scattered forests between gorilla's lush, thick and moist forests and human's open, dry and hot grassland savannas (Boaz, 74). This adjustment to a new habitat set the ancestors of the gorilla on a different evolutionary path than the chimps and humans.

The effects of climate change and shifting of ecological habitats from forest to savannas played an important role in the early migrations on human ancestors. Global climate cooled between 10 – 5 million years ago (mya) with less water available, equatorial forests shrank into fragmented woodlands. Forest dwellers needed to adapt to more time on the ground in open savanna habitats (Wade, 15). The first bipedal apes were of the Genus *Australopithecus* with fossils found from 4.4 mya (Wade, 17). From 3.2 mya, cooler drier climactic conditions resulted in shrinking forests placing pressure on *Australopithecus* leading to a leaf eating species called *A. robustus* (Wade, 18).

To obtain a clear understanding of human variation we can retrace the footsteps of early *Homo sapiens* and their myriad of hominid ancestors that emigrated out of Africa and into Middle Eastern Asia and beyond. Following the first biped *Australopithecus* the eventual emergence of the Genus *Homo* appeared on the African savanna. Early *Homo* species showed slightly larger brain size than *Australopithecus*, though nowhere near that of modern humans. This shows that the bipedal trait began far earlier than the shift to the larger brains of modern humans. Another split occurred into *Homo habilis* with a larger brain size of 600-800 cubic cms, with 400 ccm for chimps, 400-500 for *Australopithecus* and 1,400 ccm for modern *Homo sapiens*. Ratio of brain to body volume shows similar pattern; chimp = 2, *Australopithecus* = 2.5, *H. habilis* = 3.1 and *Homo sapiens* = 5.8 (Wade, 18). The most significant differences along primate's evolutionary path in brain to body volume occur between *H. habilis* and *H. sapiens*, even though they are grouped together under the same Genus!

Here is an example of the misunderstood concept of race as applied by social Darwinists to justify corporate monopolies and wage-slavery factory workers -- later misused by right wing Christians trying to debunk evolution by making claims of "man descended from monkeys" instead of researching the complexity of archeological research that indicates humans and other living apes all share a common ancestor. Six million years of evolutionary adaptations have placed humans and other primates on a radically different course. Brain size, head measurements and other physical differences, especially skin color, was used by various European colonist nations to justify their concept of race and ethnic variation as a "superior vs. inferior" debate instead of a "human variations as adaptations to changing ecosystems" debate. Certain people are adapted to specific climates and cannot perform regular activities of efficient food gathering work if the climate is extremely sunny or cloudy, hot or cold, wet or dry, etc., based on their inherited features and place of origin.

The European colonists of Africa and the Southern American colonies were not adapted to the extremes of heat found near the equator and only could survive in this hostile habitat by enslaving the local indigenous populations. This is far from any "superior" behavior when compared to the ecosystem factor; the result of establishing a dependency on indigenous slave labor created a potentially hostile climate for their descendants. During earlier times our ancestors' bodies were adapted to the ecosystem they inhabited, and gradual changes in climate and diet over several

generations were more likely than the attempts at establishing permanent colonies of European settlers in the equatorial regions of Africa. This fact did not escape the social Darwinists either, as their justification of “survival of the fittest” implied rule from afar with military occupation.

In this process the forced occupation for the financial interests of the plantation owners forced indigenous populations into slave labor and destroyed their ecosystem with short term for profit agriculture, mining and timber harvesting. Then the wealth and economies of those dependent on the slave labor becomes weakened after decades of occupation and resource extraction by British, French and other European colonies in Africa. When the local indigenous peoples were plagued with famine, food riots, revolutions and other indigenous expressions of ecosystem collapse resulting from occupation the colonists began to see their errors. Years of overuse of the land from intensive plantation style agriculture instead of indigenous forest gardening and symbiotic permaculture had decimated the ecosystem as rainforest soil takes hundreds of years to build up to previous thickness. Prior to all these recent events, some distant ancestors may have lived lifestyles more adaptable to regional ecosystem conditions.

Other Homo species lived around the African savanna and adapted their diet and physical bodies to the changing ecosystem. Homo ergaster had shorter arms and barrel shaped ribs, not cone shaped ribs like apes. This reflects changes in diet, as cone shaped ribs are needed by apes to cover their larger stomachs for plants. Tubers, plants with starchy roots, became a new food source for H. ergaster in the more arid savanna climate (Wade, 21). Paleoanthropologist Robert Klein believes that H. ergaster species lost their body hair after living in hot, dry conditions of the open savanna and needed to sweat (Wade, 23). Secondary supporting view is for ornamental purposes and lower threats of lice, fleas, ticks, etc. (Wade, 23).

Around this same time a gene appeared in H. ergaster that makes the melanocortin receptor protein that determines skin color by producing and regulating melanin. With less body hair and fewer trees around to protect H. ergaster from sunlight exposure, an adaptation was needed to prevent loss of folate to excessive UV radiation. All indigenous Africans have the same version of this melanocortin gene, though people found outside Africa have many different versions (Wade, 24). This process has taken considerable time to occur. The African version of the gene is set for maximum blackness to protect from UV radiation in higher levels near the equator. Any changes in DNA to make skin tone lighter would result in those descendants being vulnerable to UV radiation's destruction of folic acid (Wade, 24). The changes in lighter skin color among humans migrating out of Africa only became possible as they lived in temperate climates further away from equatorial Africa where UV radiation was not as intense. Lighter skin then became a needed adaptation to climates with lower levels of solar radiation as excess melanin would result in a vitamin D deficiency. This could be an adaptation to an ancestral condition as chimps have light skin tone under darker protective hair, with melanocortin receptor genes also found in different versions (Wade, 24-25). Living in a shaded forest canopy, having light skin to absorb extra vitamin D would be an advantage.

This evidence shows reasons for differences in melanin content and the resulting “races” are the result of generations of evolutionary adaptation to usual amounts of sunlight exposure for that specific region. The distances traveled from the equator over time can influence this noticeable change between opposite polar ends of the Earth.

The migrations of humans out of Africa resulted in significant climatic adaptations after only a few generations considering the varied climates they encountered. Never before had evolving hominid primates experienced

the cold, wet snow and blowing winds of the Eurasian grassland steppes, a much colder version of Africa's grassland savannas. Nor were the mountain slopes of Africa any comparison to the much colder northern ranges of the Alps, Himalayas and other natural barriers to migratory land bound mammals.

Surely the land bridge across the Bering Strait from northeastern Asia into North America with ancient polar bears and blizzards wasn't any reminder of earlier days in tropical Africa. The rate of climate change and migration into hostile climates cannot exceed the ability of the species to adapt over time.

Today polar bears of modern times are facing extinction from human induced climate change as ice sheets melt into the open ocean faster than the polar bears can adapt. Our own human built cities along the coast may soon become permanently flooded from rising sea level as all that polar ice turns into ocean. Our dependency on technological quick fixes like channelizing levees, dredging and canals has left us vulnerable to an ever rising ocean and ever stronger storms characterized by climate change. Dredging into forested swamps for petroleum transport canals have resulted in deterioration of the previous protective services offered to New Orleans from surrounding cypress bayou forests (Neinaber/Snow, website).

Trees once able to absorb the brunt of storm surge from hurricanes have been killed by saltwater intrusion from the oil transport canals. The recent process of "civilization" building permanent cities near rivers and coastal regions in the Americas following European colonization was not planned for practical purposes other than economic and aesthetic ones. Indigenous peoples also established shelters and lived for a majority of their time along rivers and coasts, though also understood that these villages were temporary and would need to be abandoned during storm and flooding events. Predicting seasonal flooding made localized inland migrations before storm events a cultural norm for indigenous peoples. Since the beginning time of Homo sapiens migrating out of Africa and eventually into Euro-Asia, East Asia and the Americas, population densities, climate shifts and food availability have determined the frequency and distances of these migrations.

The reasons for early humans leaving Africa are mostly natural population diffusions into less crowded land and some new food storing, preparing and growing methods for edible plants and animals that enabled longer distances to be covered on foot by African emigrants. Even within Africa relatively sedentary human populations have traveled considerable great distances within their rainforest home to increase their genetic diversity. Pygmy (Mbuti) tribes of the African rainforest continue the tradition of men marrying women from a far away village to avoid chances of marrying any close relatives (Cavilli-Sforza, 53). Nomadic tribes travel following animal herds in patterns with changing seasons on planned routes. These two versions of migration were far more common over human evolution than the distinct later occurring forms of colonization (Cavilli-Sforza, 53-54).

Mass migrations are rarer than either nomadic cyclical wandering or regional migrations of sedentary people; as the goal of colonists is usually settling new territories by force. One form of mass migration called colonization is a deliberate settling of new territories, usually a response to saturation and overpopulation at home (Cavilli-Sforza, 55).

Colonization occurred recently in the expansionist empires of Greece, Rome, Britain the U.S. and others. Our most significant recent colonization effort was the settling of the Americas by people from Europe and their imported cargo of human slaves from Africa. This coincided with genocide and assimilation of North America's indigenous peoples. Colonization is also a form of imperial state expansions and evolved out of ever increasing population centers and intensive agricultural

practices. From 100,000 to 50,000 years ago modern humans began adapting to a new environment (Cavilli-Sforza, 92). This adaptation included innovative methods of harvesting, reseeding and tending edible plants either for direct consumption or for feeding domesticated animals.

Significant advances on agriculture and animal domestication were mirrored by exponential population growth at an ever accelerating rate. Population growth occurred over 10,000 years from five million to present day population of 8 billion. Agriculture increased the rate of growth on average 14 times more than during the Paleolithic (Cavilli-Sforza, 95). The exponential rate of population growth in last century was 250 times greater than the Paleolithic (Cavilli-Sforza, 95). A great deal of this past century's population growth is a result of industrial agriculture and synthetic nitrogen fixation of petroleum-based fertilizer. This input occurred in addition to previously effective methods of manure and composting, including mechanized harvesting methods. The problem with the intensive industrial agricultural method is it depletes nutrients from the soil from overuse and runoff, resulting in desertification. The response of industrial agriculture to soil nutrient depletion is to add synthetic petroleum-based fertilizer and bioengineered GMO crops to fight off growing swarms of GMO resistant insects.

The theory of peak oil indicates that the substance used to manufacture synthetic fertilizers may become less easily available as demand increases and supply decreases. Poor planning and short term profit motives on the part of our elected leaders has enabled this process to continue unchecked in greater human society. War, famine and epidemics are nature's population control mechanism of humans (Cavilli-Sforza, 95). To study our human ancestors and their lifestyle of adaptation to the savannah ecosystem may help our current status if survival of the human species in some form is the desired outcome. There are certainly less destructive methods of agriculture and food acquisition throughout history.

Other times of increased population expansion and migrations occurred during different eras. The reasons for the Paleolithic expansion are less well understood than the Neolithic transition from hunter/gatherers to crop cultivation and animal domestication in the Middle East (Cavilli-Sforza, 97). New strategies for food cultivation occurred nearly simultaneously and separately in the Middle East/(Northern Africa), China, Mexico and the Andes of South America (Cavilli-Sforza, 97). These same regions continued on their paths to become major centers of highly advanced empire-building and began the process of colonization and outward expansion.

The Middle Eastern/North African empires of Egypt, Sumeria and Babylon fought, merged, expanded and later morphed into the Roman Empire then later became the British Empire and today exists as the U.S. The Aztecs, Mayas and Incas of the Americas were simultaneously following a similar path of colonist expansion in the Americas, though were not able to complete their expansions for various reasons. The Chinese empires were stable until they met their match in the Mongols under Genghis Khan, though have retained their status until today. The common ground shared by all these early colonist empires was consolidated and organized agriculture systems, including some mining of metals for tools. However, the ever outwards expansion of colonization also was resource intensive and had often severe ecological responses that significantly lowered human population and induced further migrations into previously unoccupied territories. In recent instances of colonization, the American territories were not unoccupied, only left intact and tended by the indigenous occupants who had symbiosis and adaptability with the ecosystem as their priorities instead of resource extraction for profit as the European colonists following Christopher Columbus did (J. Diamond, Ecobooks website).

There are several changes in the three consecutive Stone Ages that shaped the diets, culture and lifestyle of modern humans. The Paleolithic Old Stone Age began around 2 mya with the first regular usage of stone tools and ended around the last Ice Age 15,000 years ago. During this time two distinct species of Genus Homo appeared, *H. erectus* in the lower Paleolithic and *H. sapiens* in the upper Paleolithic (Sykes, 132). After the end of the Upper Paleolithic a vague and blurred boundary enters into the Mesolithic Middle Stone Age after the last Ice Age and marks the beginning of agriculture. The transition into the Neolithic New Stone Age was far more dramatic and begins the usage of pottery and advanced farming tools like scythes (Sykes, 132). The advances and growing brain power of humans coming out of the Neolithic began the exponential population growth curve and eventually modern civilization of industrial agriculture.

The exponential rate of advancement of civilization from the Neolithic New Stone Age to our modern civilization is recently and currently highly dependent on technology and petroleum-based chemicals for transportation, agriculture and raising of domesticated livestock – this is a wicked curve not unlike the scythe or sickle blade used to represent the cultural interpretation of Grim Reaper, or Death. The symbolic representation of a black hooded Death holding this early agricultural tool used for harvesting grain is appropriate to explain the exponential curve of population growth following recent petroleum-based industrial agriculture.

We are promised that technology will continue to sustain our large human population with recent advances in bioengineered genetically modified food crops, or GMOs. However, GMOs maintain petroleum dependency with GMO plants matching specific pesticides while insects, weeds, blights and other “pest” species evolve resistances to the synthetic toxins faster than Monsanto researchers can shove the latest GMO toxin down the mouth of a lab rat and chart the results. The resistance of weeds to GMOs has already been observed by farmers in India, “resistance genes can also move into related crops and species,” creating “super-weeds” that outlive any pesticide (V. Shiva, GoS website). Dependency on massive amounts of petroleum-based fertilizer input to sustain agribusiness is our other major problem, as stated by Jan Lundberg.

According to peak oil researcher Jan Lundberg, our species is at a crossroads with unpredictable outcomes: “The challenge before us all is to survive an ecological correction unprecedented for our species. The correction will include an economic collapse and conversion to subsistence activities and trading.” (Jensen, 109). Other likely outcomes less harsh include people voluntarily returning to simpler hunter and gatherer lifestyles following ecosystem restoration and also increasing permaculture farms that are self sufficient nutrient recyclers. Removal of dams would increase the salmon population, and restoring bison to their former range would ensure a surplus of meat for those willing to hunt wild game. Permaculture farming is defined as an agricultural method that integrates human activity within the natural existing surroundings to create highly an efficient self sustaining ecosystem (Merriam-Webster website). Polyculture is a version of permaculture that uses many different crops growing together in a symbiotic manner. One example of polyculture as practiced by indigenous North Americans is the “three sisters” combination of corn, beans and squash. Oak trees and their crops of nutritious acorns will also be available without any additional fertilizer or pesticide input as these trees are adapted to the local ecosystem.

There exist as many variations of poly and permaculture as there are different habitats we can adapt ourselves with. We cannot expect GMO monoculture crops of industrial agriculture to sustain our current human population indefinitely, though indigenous farming methods, poly and permaculture, and a restoration of ecosystem habitat for native plants and animals can help humans survive upcoming peak oil collapse and climate change.

The recent problems faced by humans are the accumulated results of ever expanding colonist imperialism and empire building following the Roman Empire and the recent activities of Britain and the U.S. in world conquest attempts. Nobody knows the negative effects of the colonist British expansionist efforts in North America on the ecosystem better than the indigenous peoples of this continent. The ecological destruction of a land once teeming with edible native plants and wildlife has been relatively decimated after only four hundred years following European colonialism and empire building in the Americas. This effect is visible in the lack of native bison and salmon, mostly from overhunting, displacement and loss of habitat. In the case of the salmon the dams used by industrial agriculture degrade the riparian ecosystem and prevent salmon from accessing their previous habitat of unpolluted tributaries. This wholesale ecological destruction largely for profit has caused members of the North American indigenous people's resistance movement called AIM to declare the entire U.S. civilization as an intrusive presence in this continent. Says American Indian Movement activist and former UC Boulder professor Ward Churchill, "What I want is for [U.S.] civilization to stop killing my people's children. If that can be accomplished peacefully, I'm glad." Ward goes on to list the many diverse methods of peaceful protest used to obtain protection for indigenous peoples in the U.S., then continues, "Given that my people's children are being killed, you have no grounds to complain about whatever means I use to protect the lives of my people's children. And I will do whatever it takes." The crowd at this event somewhere in North America is reported to have given Ward a standing ovation for his statement (Jensen, 253).

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