How Cooking Makes Us Human

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The question of what makes us human is a common one among anthropologists and scientists alike. Many factors of evolution are explored to determine the point in history where our ancient ancestors branched away from primate lines, and there is no greater contention in anthropology than when to date humans. This is an important topic of study because it relates to the origin of the human genus as well as species and allows for the broader study of humanity. By pinpointing what behaviors shifted human evolution away from primates, one can continue to examine further behaviors and cultures that developed as uniquely human. From physical bone structure, to behavioral change, and even socialization, all aspects of what makes humans have been examined. Recently, there is a more contemporary argument emerging that cooking and human's control of fire is the transformative movement leading to human development. The idea behind this is that fire and cooking led to brain development and a social evolution that produced all things which are uniquely human. The "cooking hypothesis"- a term used by those who believe fire and cooking is the point of human origin- works to encompass all other arguments for what makes us human. This argument is breaking down past theories and assertions about human evolution and will be the focus of this essay as the answer to what led to human origins.

To definitively answer the question of what makes us human, one must first examine aspects of the many different theories and answers previously accepted in the scientific community. When the fossil "Lucy" was found by Donald Johnson, the point of origin for humans was set at the emergence of bipedalism; though, the "Lucy" fossil and those found like it still show evidence of ape like behaviors for species of this time (Leakey 1993). The arguments for bipedalism don't explain the transition in behaviors away from apes other than the physical bone structure and how the body was carried. Leakey (1993) argues that humans were not different from apes until later in time, with the development of cooperation and a more complex social life. He uses the discovery of the "Turkana Boy" in 1984 as a basis for this argument (Leakey 1993). The estimated height of the Turkana Boy and smaller pelvis bone measurements indicate a further change away from ape like behavior and appearance. The larger brain volume also leads Leakey (1993) to write of the higher social evolvement of this species.

Others would argue that it is not a physical change that created our species, but rather a mindset and development. Joseph Henrich (2015) and Milton Dawes (1994) make claims to this extent. Henrich (2015) argues that humans crossed a "Rubicon" from genetic evolution to cultural, which allowed the species to develop beyond others. With this argument, humans developed after their brain capacities evolved in a way which allowed for the formation of culture. Milton Dawes (1994) also argues that it is mindset and brain capacity which sets

humans apart from other species. Milton credits bipedalism, tool use, and social role development as products of higher brain functionality saying:

> "We have a relentless drive to understand ourselves and the universe of which we are a part. Full of questions and questions about our questions, we want to know what makes us human? Where did we come from? How did the universe start? Where are we going? What's the fate of the universe? How do we know what we know? Not only do we want to know, we want to know everything. We do not just adapt to our environments; we change environments to suit ourselves (Dawes 1994:282)."

This means that our species pushed itself to greater physical and cultural adaptations, subsequently making humans what they are. Even Darwin, though credited with saying that the art of fire is "probably the greatest discovery, excepting language, ever made by man," assumes fire as irrelevant in the course of evolution. He credited human evolution with human's ability to adapt and survive to greatly changed circumstances, similarly to Dawes' position. The issue with these arguments is that it is assuming our early ancestors had the brain capacity and curiosity to pursue greater cultural adaptations. It is also difficult to find physical evidence to prove a moment when the Rubicon was crossed allowing cultural evolution, or evidence indicating curiosity in early species. Though these arguments could relate to Leakey's (1993) argument that cooperation and social development created humanity. They also create theories tying into brain volume and capacity, though neither Henrich nor Dawes study brain volume changes among early species.

Further evidence in support of sociality and interactions as motives for human origins is offered by Elizabeth Culotta (2010). Based on arguments that 40,000 years ago, when modern humans migrated to Europe, there was an explosion of art and culture, indicating a jump in cognition. Culotta (2010) offers evidence found of art dating back from 90,000 years ago, as signs of human cognition beginning much earlier than once thought. Marine shell beads were found in Israel dating 90,000 years ago and etched eggshells dating back 60,000 years ago have also been uncovered; as seen in images 1 and 2 (Culotta 2010). This evidence shows that species were writing and creating art much earlier in the evolutionary timeline than once thought. She argues that perhaps it is not individual cognition which appeared 40,000 years ago, but rather collective. Culotta's (2010) theory means that, "modern humans" did not get smarter, they just grouped together creating a much bigger and more noticeable event in history. This theory is also reflected in Henrich's (2015) book and is coined the "communal brain". Culotta (2010) provides physical evidence to support her theory that humans underwent a cognitive leap much earlier than once argued, and it was a coming together and shared culture which presented itself in a creative burst starting at 40,000 years ago. This means that modern human behavior started earlier and was cultivated by shared experiences and cooperation.

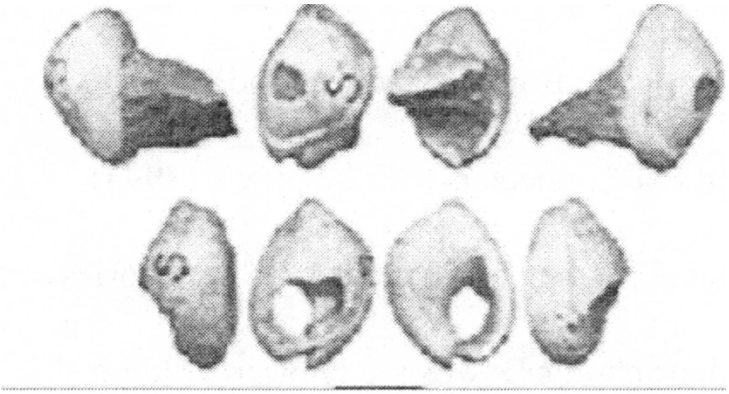

Image 1. (Culotta 2010)

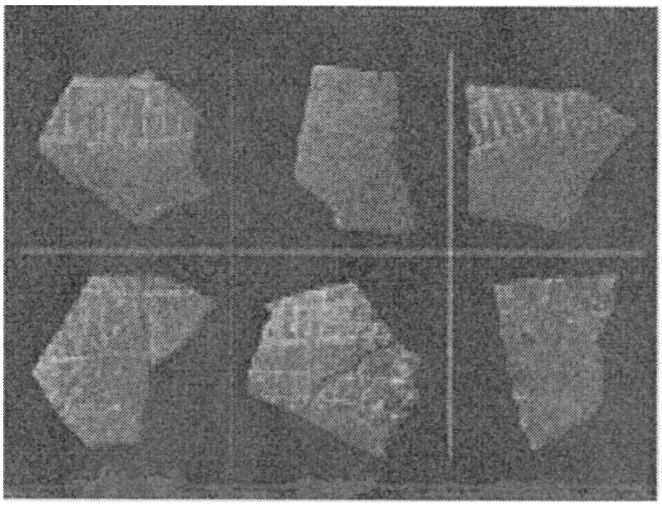

Image 2 (Culotta 2010)

Though cultural advances can be explained through the coming together of our ancient ancestors, and increased cooperation, these theories neglect to thoroughly explain the physical development that occurred when modern humans evolved. What makes us human is a combination of both physiological and psychological advances away from primates. Theories to pinpoint the origin of humanity must both explain the physical changes that occurred in evolution as well as the behavioral ones. A commonly accepted theory, stemming from the

l 950's is titled the " Man -Hunter" hypothesis. This hypothesis bases human origins on the inclusion of meat in our diets and works to explain the changes that occurred when our ancient ancestors began hunting. Buss (2011) looks at digestive systems between humans and apes as evidence for the hunting hypothesis. Humans' guts are primarily made of small intestine, which allows for rapid digestion of proteins, while apes' guts are primarily the colon, which is indicative of a vegetarian diet. This physical evidence supports that hunting was the evolutionary branching point between apes and humans (Buss 2011). Tool usage and teeth morphology are also credited with the inclusion of hunting. Buss (2011) examines the enamel on the fossilized teeth of early humans, finding little wear on them indicating less grinding down of plant matter. This argument stems from evidence of tool use and

cutting marks on bones found 2.6 million years ago with the emergence of the habiline species (Wrangham 2009).

The development from Australopithecus to Habilis to eventually Homo Erectus is explained, under the "Man-Hunter" hypothesis, with the digestion of meat. Richard Wrangham (2009) states that, "human characteristics such as long-distance travel, big bodies, rising intelligence, and increased cooperation" can all be explained with man's need for meat and adaptations to increase success when hunting (7). Since this theory does explain many significant changes that occurred between the evolution from australopithecine to human, many anthropologists have accepted it without question. The problem with the "Man-Hunter" hypothesis is that it does not account for every adaptation and change which led to the rise of humans. Specifically, as Wrangham (2009) points out, this hypothesis does not account for gathering practices and why they could develop. It also does not consider mating practices and social development outside of hunting party cooperation.

The "cooking hypothesis" takes the "Man- Hunter" hypothesis one step further and offers a more complete picture to human evolution. This theory maintains that the point at which humans began evolving away from primates coincides with the development of cooked and processed foods. The changes that occurred both behaviorally and physically can be related to how cooked and processed foods affect the body. Richard Wrangham is the leading scholar in this field, offering some of the first comprehensive arguments in favor of the invention of cooking food as the point of origin for humans, which all started with a control of fire. Since evidence for fire is rarely found, due to destruction of fire sites; the malleable nature of physical evidence from fire; and the non-distinct differentiation between controlled fires and wildfires, pinpointing the exact moment in history that the humans-controlled fire is difficult. Those who follow this up and coming theory argue that the control of fire began as early as 2 million years ago with the emergence of Homo Erectus. If fires were being built around 2 million years ago, they can explain the rapid developments which occurred at that point in time, initiating a change in genus from australopithecines to habilines to Homo Erectus.

The study of fire is relatively new in anthropological fields due to the rarity of finding evidence, but with new archaeological finds, the study of fire has reopened discussions on human origin (Gowlett and Wrangham 2013). Though most evidence dates fire control with Homo Sapiens, evidence has been found within the decade that could lead to the conclusion that fire control started much earlier with previous species. Jean-Laurent Monnier of the University of Rennes has uncovered a fireplace that has been estimated to be 465,00 years old, a date which falls within the time period for Homo Erectus (Balter 1995). Balter (1995) reports that researchers have found that burnt pebbles and charcoal remains are strong indicators for human controlled, purposeful, fire; allowing for the search for fire evidence to be targeted more specifically. If new evidence such as the fireplace Monnier uncovered is concluded to be correctly dated and," if H. Erectus did indeed use fire in a tended hearth for cooking, the finding may have important ramifications for understanding human social evolution" (Balter 1995: 1570).

Though there is not much evidence to support fire usage as far back as 2 million years ago, as Wrangham (2009) claims, there is evidence for fire activity at 1.7 million years ago. Through the examination of red sediment and charred bones throughout African cities, scientists can say that fire usage was a part of early hominid activity (Roebroeks, Villa, Trinkaus 2011). It should be noted that the evidence dating back 1.7 million years, does not show a habitual control of fire but rather a usage of preexisting fire (Roebroeks et al. 2011). This does show that arguments can be made for fire usage in early hominids and opens the door for further research into the "cooking" hypothesis. Gowlett and Wrangham (2013) agree with Roebroeks (2011) in that though there is evidence at East Turkana in Kenya that points to fire use at 1.8 million years ago, most of the evidence from this site dates closer to the 1.6 million year ago range. An examination of artifacts found in an Oldowan cave site have been interpreted as probable evidence for control of fire (Gowlett and Wrangham 2013). Though there is limited evidence found in the past pointing to early control of fire in the Homo genus, there has been more recent archeological finds that provide evidence in favor of these theories causing a reexamination of the previous evidence. Since early fire usage is hard to physically prove, even the slightest physical evidence in support of Homo Erectus control of fire cannot be ignored, and the implications for an early human species controlling fire is huge.

Control of fire is the basis of the "cooking hypothesis" and hinges on this detail in human evolution. Though exactly when humans had full control of fire has yet to be proven, one can say that there is ample evidence and discussion that the dates go back further than was once understood. This inclusion of fire activity in life leads to further cooking and food preparation, a key step in the development of modern humans. Apart from the evidence of fire usage, there are other aspects of human evolution that the "cooking hypothesis" works to explain.

The aspects of human biology that are often cited when looking for what makes us human progressed from use of fire and digestion of cooked foods. When looking at human evolution from a biological perspective, tooth size, gut size, and range of motion are considered. Biologically, modem humans have adapted in such ways that do not allow for the consumption of raw food (Wrangham 2009). As humans moved further away from apes, they developed smaller guts which allowed us to walk and run further distances, but made the processing of raw, fibrous material much more difficult. Humans adapted and overcame this by cooking their food (Wrangham 2009). Gowlett and Wrangham (2013) later write to the same effect that,

> “The most obvious aspect of human biology associated with the requirement for a cooked diet is a reduced digestive system compared to great apes, including small molars, mouth, stomach and large intestine. The benefits of gut minimization include less energy having to be spent in metabolic activity. Since these benefits could not have been realized until high-quality foods were available all year, tooth and gut reduction appear to be unambiguous markers of adaptation to cooking (11).“

Both changes are found with the emergence of Homo Erectus, leading us to believe that this species-controlled fire (Gowlett and Wrangham 2013). Tooth morphology is also a strong indication for the introduction of cooked foods. The evolutionary consequences to food processing led to smaller teeth and weaker jaws. The evidence found from early humans shows that these adaptations were made from lessened time spent chewing food, and a lower need for

larger teeth to use for cutting tissues and fibers (Organ, Nunn, Machanda, Wrangham 2011). Molar size and time spent feeding are directly related to behavioral changes found in history and are correlated with the use of fire and processed foods. With the emergence of Homo Erectus "the evolutionary shift in dietary habits (including reduced feeding time) likely causally preceded these morphological adaptations because cooking or non-thermally processing food decreases its toughness, which reduces the need for high bite forces and changes feeding patterns" (Organ et. al 2011:10). As seen in image 3, a clear reduction in jaw size occurred in Homo Erectus, which continued to decrease in Homo Sapiens. Jaw size is related to chewing force and musculature around the face in relation to dietary habits and needs. Gorman about how (2008) Wrangham studied ape chewing times and was able to conclude that with the tooth size evident of Homo Erectus, they would have to spend 5.7 to 6.2 hours a day chewing raw meat. If it was not gathering food it would be forced to spend the rest of the day chewing the meat, giving reasonable suspicion that food processing of some sort occurred with this species.

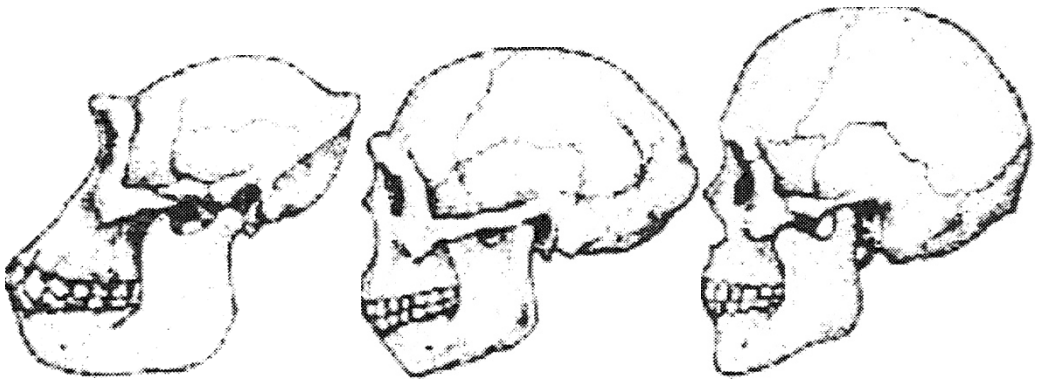

Image 3. (Jim Folley)

Bipedalism and frame structure are also associated with changes made from cooked meals. Larger body sizes show an increased need for higher calorie meals, which processed foods offer (Organ et. al. 2011). This greater calorie intake allowed humans to have to eat less often allowing the species to focus energy on other tasks. The long legs and shorter trunk of Homo Erectus indicates a lowered ability to climb, which is hard to explain with any other hypothesis of human development other than the use of fire (Gowlett and Wrangham 2013). Along with the control of fire comes the safety in provides, allowing species to sleep on the ground rather than having to climb into a tree for protection. Gowleet and Wrangham (2013) summarize the physical development cause by humans with:

> “The key points appear to be that brain size had already reached 1000 cm3 one million years ago, that major tooth size reduction in Homo had already happened by 1.7 Ma and that changes to more modem body form came soon afterwards (being achieved by 1.5 Ma as shown by the Nariokotome specimen (Pontzer et al. 2010) (20).”

This acceleration in physical evolution came with the control of fire and therefore cooked foods. A final argument which can be made for the biological aspects of cooked food and evolution lies within genetics. It is undisputed that both modem humans stem and Neanderthals

had control of fire as early as 400,000 years ago, and both shared a large portion of genetics. It is along this line of thinking that Gowlett and Wrangham (2013) postulate that a shared common ancestor who also has control of fire is not out of reach thus accelerating the evolution of modem humans. When the conservatism of material culture for early species is considered, the argument gains force.

Wrangham uses the science behind cooking food as another piece of evidence in support that it was cooking food rather than simply consuming meat that furthered human evolution away from australopithecines and other primate lineages. Cooking softens the food allowing for more rapid digestion (Wrangham 2009). Historian Michael Symons concurs, stating that a cook's main goal has always been to soften the food. Softer food and quicker digestion allow more energy to be saved and stored. Cooking vegetables and meats also allows for new compounds to be formed, greater nutritional value, and a larger number of calories ingested. The energy both gained from cooked food compounds and saved from chewing allowed for brain expansion and psychological development.

Social factors such as grouping and cooperation, often argued as what makes our species human, were a result of fire and increased cooking practices. The cooking hypothesis works to explain why sociality developed along with increased cooperation, placing the origin of humanity back further than what cooperation theorists such as Darwin, Leaky and Culotta argue. The main argument here is that it was fire that created cooperation rather than the other way around. Gowlett and Wrangham (2013) maintain that the decreased gut size in humans allows energy to be spent expanding brain size in early species. As examined previously, the smaller gut is a direct consequence of fire use, and it is scientifically accepted that increased brain size in species allows for more social development. Cooking allows humans to evolve larger brain sizes at a much faster rate than any other species. Another part of cooking and the rise of humanity is its influence in societal development. Though the use of hunting has been found to increase both intelligence and group cooperation among our early ancestors, cooking moves beyond that to both foster family development and a division of labor. Wrangham (2009) hypothesizes that cooking meals allowed men to go out hunting all day and return to a meal which required little chewing. This development allowed early hominids to create "predictable economic exchanges between men and women"- pushing the creation of households, a process mostly unique to humans (Wrangham 2009:146).

Using "evidence of hominin fossils, landscapes and various aspects of the archaeological record" assertions can be made regarding early species' social life and evolution (Gowlett and Wrangham 2013). Wrangham (2009) goes on to suggest that cooking and hunting practices are what led to rudimentary patriarchal societies and gender roles. Since foods found by hunters are brought back to a base camp to be prepared, women are given the domestic chore of cooking meats gathered by male hunters. Going one step further with this family oriented theory, it can be hypothesized that it is because of cooking that early humans formed pair bonds; "Having a husband ensures that a woman's gathered foods will not be taken by others; having a wife ensures the man will have an evening meal" (Wrangham 2009:154). Males would travel while hunting, allowing females in the group to create base camps around fires and gather sustenance from around the area (Wrangham 2009). This allowed for the development of social roles and cooperation among people, both factors that

are related to as staples for humans and covers adaptations that the "Man-Hunter " hypothesis falls short on.

A leap in evolutionary advancement occurred with the emergence of the species homo erectus, ultimately leading to several key characteristics of humanity being formed. This species had developed the largest brain size as well as exhibited the biggest drop in tooth size in evolutionary history. The question is why: what catalyzed the evolution of humans away from primate stems? The "cooking" hypothesis puts food preparation at the center of human development. Whether it was full control or limited use of natural fires, fossil evidence stands that early hominid and homo species used fire in their lives and to process food, explaining what caused the emergence of this new species. From biological advances to behavioral ones, humans began making adaptations and began to evolve away from primates with the control of fire and eventual cooking of food. From gut size, tooth size, to even bone structure, the nutrients gathered, energy gained, and time saved with food preparation allowed humans to evolve as a species. Though arguments made are oftentimes theory based, there has been a resurgence of evidence in support of earlier dates of fire usage with humans, giving the "cooking hypothesis" ground to stand on. With this evidence and Wrangham 's continued push, human evolution is being reexamined. Cooking behaviors successfully incorporate and produce all things that are understood to be uniquely human, creating a direct point of origin for humanity, and offering a definitive answer to what makes us human.

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