ESSAI

Volume 7 Article 31

4-1-2010

Identity of Newly Found, Fully Intact Hominid Skulls from Ethiopia

Chris Lemke
College of DuPage

Follow this and additional works at: http://dc.cod.edu/essai

Recommended Citation

Lemke, Chris (2009) "Identity of Newly Found, Fully Intact Hominid Skulls from Ethiopia," ESSAI: Vol. 7, Article 31. Available at: http://dc.cod.edu/essai/vol7/iss1/31

This Selection is brought to you for free and open access by the College Publications at DigitalCommons@C.O.D.. It has been accepted for inclusion in ESSAI by an authorized administrator of DigitalCommons@C.O.D.. For more information, please contact koteles@cod.edu.

Lemke: Identity of Hominid Skulls

Identity of Newly Found, Fully Intact Hominid Skulls from Ethiopia

by Chris Lemke

(Honors Biology 1151)

ABSTRACT

Region of Ethiopia. Objectives were to date the skulls using Uranium-235, and to identify each of the skulls. Uranium-235 dating indicated skulls A and B to be 2.9 million years old, and skull C to be 1.7 million years old. Each skull was properly identified using existing fossil data. The two oldest skulls were found to be *Australopithecus afarensis*, and *A. africanus*. The younger skull was identified as *Homo habilis*. A discrepancy was found in the measured cranial capacity data against existing data. Due to condition of the newly found fossils, the most likely explanation for the discrepancy is inaccuracy of existing fossil data due to incomplete and fragmented specimens, or that the skulls in question were representative of a juvenile hominid.

INTRODUCTION

The earliest evidence for both ape and human evolution has been found in the Afar region of tropical Africa (Stringer et. al. 2005). The Afar region is at the northern end of the East African rift valley (Day 1986). The Afar rift has yielded an unparalleled record of early hominid biology and technology (WoldeGabriel et. al. 2000). The three specimens discovered are known as hominids. Hominids are extinct species that are more closely related to humans than chimpanzees (Campbell et. al. 2008).

Much of human ancestry can be summed up in two broad themes: first, that Africa is Homo sapiens original home; secondly, some australopithecines were intermediate species between ape and man (Berger 2000). This is known as the "Out of Africa Model". Many early hominid species such as *Australopithecus anamensis*, *A. afarensis*, and *A. africanus* are believed to be likely ancestors of Homo (McKie 2000). *A. afarensis* has a reasonably complete fossil record, which includes the famous skeleton known as Lucy (Arsuaga 2006). *A. afarensis* is believed to have evolved into H. habilis, the first Homo (Gipps 2005). *H. habilis* has been found with primitive stone tools, hence the name habilis, meaning skillful person. The idea that *H. habilis* had been a toolmaker was a factor that promoted *H. habilis*' acceptance as a human ancestor (Regal 2004).

Recently, three fully intact skulls have been found in the Afar Region of Ethiopia. The objectives of this study were to: date the newly discovered hominid skulls and to determine their identity.

METHODS

Dating of the three skulls was determined by using uranium-235. Six soil samples were taken per specimen at the specific region where each fossil was found. The U235-Pb207 ratios, from samples were then used to calculate ages. The Mann-Whitney test was used to check for differences in the median archeological ages of the skulls. Significance was determined as $P \le 0.05$.

Skulls were fully intact, minus the lower mandibles, allowing for precise measurement and analysis. Physical features used to identify the skulls were cranial capacity, cranial index, facial measurements such as nasal index, along with dentition data.

RESULTS

Table 1 summarizes the ages of the skulls. Referring to the skulls as "A", "B", and "C", skulls A and B were the oldest, and did not differ significantly in age from one another, while Skull C was significantly younger than Skull A (u=0) and Skull B (u=0). Skulls A and B were determined to be two separate species of australopithecines, that being *A. afarensis* and *A. africanus*, respectively. Cranial capacity measurements of skulls A and B conflicted with existing cranial capacity values of adults from their respective species (Table 2) concluding the specimens were possibly juveniles (Figure 1), or since these skulls are completely intact specimens, the cranial capacity measurements are more accurate than measurements previously taken with less complete fossils.

Dental analysis showed a unique 0.5 cm gap in the upper dentition of skull A, between the lateral incisors and canines, of which is unique to *A. afarensis*. Measurements of the nasal cavity of skull B showed that it was wider than it was tall which (Index above 100), while characteristic of two different species of australopithecines, *A. africanus* was the only species that had an age closest to that of skull B (Table 3). Due mainly to its cranial capacity, and more human like appearance, skull C was identified as *H. habilis*, as opposed to other species of the genus *Homo* that were known to exist around the same time period (Table 4).

DISCUSSION

The results reveal a discrepancy between the cranial capacity of skull A and skull B, and the existing cranial capacity data from their adult counterparts. One of two possibilities exist for the presence of these discrepancies. First, both skulls show a cranial capacity much lower than expected. Research conducted recently has attempted to calculate possible brain size in infant hominids. These studies suggest that australopithecines gave birth to infants with cranial capacities that were on average 180 cc. These results have implications for interpreting the evolution of the birth process and brain development in all hominids from the *Australopithecus* and early *Homo*, through *H. erectus*, to *H. sapiens* (DeSilva et. al.2008). It is possible to conclude that even though both skull A and skull B had a relatively low cranial capacity, these values could represent an intermediate cranial capacity, a juvenile specimen.

Another possibility is that previous cranial capacity data were inaccurate due to incompleteness of fossils. The skulls found are fully intact specimens. Therefore, cranial capacity, and other metrics could be measured with a higher level of precision. In the light of these newly found fossils, there could be need to refine known data of other fossils and in turn science can have a clearer picture of hominid identification, evolution and characteristics.

The results also show that it is very plausible that *A. afarensis* and *A. africanus* were contemporaries. Not only would they have existed within same time period, they also would have lived in the same general area. This means that descendants of one species were possibly competing for food and other resources with its ancestors that they evolved from. According to the fossil record, *A. afarensis* not only led to *A. africanus*, it also branched off to produce *A. robustus* and *A. boisei* (McKie 2000). *A. robustus* and *A. boisei*, lacking primitive human like characteristics, unlike *A. africanus*, eventually hit an evolutionary dead end. *H. habilis*, one of the first species of the *Homo* genus, is thought to be evolved from *A. africanus*. Fossils of *H. habilis* have been found in roughly the same general area of Africa as the other fossil hominids previously stated. This provides different species of hominids many ways to refine themselves. Co-evolving, competing, and influencing one another, allows the dominant species, to survive and progress in the evolutionary cycle, all the way to mankind.

Literatures Cited

Arsuaga, J.L. and I. Martinez, 2006. The Chosen Species. Blackwell Publishing, Malden, MA, USA. Berger, L.R. 2000. In the Footsteps of Eve. National Geographic Society, Washington, D.C., USA. Campbell, N.A. and J.B. Reece. 2008. Biology, Eighth Edition. Pearson Benjamin Cummings, San Francisco, CA, USA.

- Day, M.H. 1986. Guide To Fossil Man. The University of Chicago Press, Chicago, IL, USA. DeSilva, J.M. and J.J. Lesnik, 2008. Brain size at birth throughout human evolution: A new method for estimating neonatal brain size in hominins. Journal of Human Evolution 10:1-11.
- Gipps, J. 2005. Dead man talking: What skulls can tell us about human evolution. Teaching Science 51:12-19.
- McKie, R. 2000. Dawn of Man. Dorling Kindersley Publishing, Inc., New York, NY, USA. Regal, B. 2004. Human Evolution: A Guide to the Debates. ABC-CLIO, Inc., Santa Barbara, CA, USA.
- Stringer, C. and P. Andrews, 2005. The Complete World of Human Evolution. Thames & Hudson Inc., New York, NY, USA.
- WoldeGabriel, G., G. Heiken, T.D. White, B. Asfaw, W.K. Hart, and P.R. Renne. 2000. Volcanic, tectonism, sedimentation, and the paleoanthropological record in the Ethiopian Rift System. Geological Society of America 345:83-99.

Table 1. Summary (mean \pm standard deviation) of the archeological ages of the hominid skulls.

Skull A	Skull B	Skull C
$2,962,285 \pm 2,141$	$2,961,892 \pm 2,496$	$1,678,133 \pm 29,210$

Table 2. Comparison of Skull A age measurements to that of known Australopithecus afarensis

Comparison	Skull A	Known Australopithecus afarensis
Date of existence (million years)	2.9	≈ 3-4
Cranial Capacity (cc)	275	380-500

Table 3. Comparison of nasal index, cranial index, and age of S_b , *Australopithecus africanus*, and *A. robustus*.

Comparison	Skull B	Known A. africanus	Known A. robustus
Date of existence (million years)	2.9	3-2.5	2-1.2
Nasal Index (W/H)	102	101	104
Cranial Index	67.6	67.5	74.9

Table 4. Comparison of age and cranial capacity of S_c to other fossils of \emph{Homo} .

Comparison	Skull C	Known <i>H. habilis</i>	Known H. ergaster	Known H. rudolfensis
Date of existence (million years)	1.67	2.2-1.6	1.9-1.4	1.9
Cranial Capacity (cc)	550	590-650	850	780

Figure 1. Comparison of measured brain size of S_a and S_b to predicted neonatal size and mean adult size for A. afarensis and A. africanus.

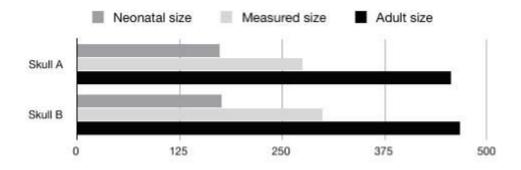


Figure 2. Upper palate and dentition of S_a and A. afarensis displaying diastemata between lateral incisors and canines.

