

**PRESS RELEASE**

**“The First Female *Homo erectus* Pelvis, from Gona, Afar, Ethiopia”**

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***Prepared by the Gona Palaeoanthropological Research Project***

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Scientists conducting fieldwork at the prehistoric site of Gona in Ethiopia have discovered the first documented complete pelvis of a *Homo erectus* female dated to around 1.2 million years ago (Ma). The soil formation that yielded the fossils is dated between 0.9 and 1.4 Ma, and we estimate the pelvis to be ~1.3 Ma. The new hominid pelvis was discovered by Ali Ma'anda Datto, an Afar colleague, on February 12, 2001. The pelvis was found in the deposits exposed north of the Busidima River, a seasonal river that feeds into the Awash River. Research continued in the area, and the excavation carried out in 2003 yielded the right and left os coxae (hip bones), and the last lumbar vertebra from one ancient woman. Numerous animal fossils, including a variety of wild antelopes, pigs, rats, horses, and reptiles were also found at the pelvis site. Gona is known for the discovery of the oldest stone tools in the world dated to 2.6 Ma. The Busidima hominid pelvis site is located ~12 Kilometers from the site of the oldest stone tool discovery.

The oldest female pelvis belonging to a hominid comes from the famous 3.2 Ma fossil skeleton widely known as ‘Lucy,’ (*Australopithecus afarensis*) also from Ethiopia. Lucy was discovered at Hadar in the Afar, a site that is contiguous to Gona, and located just a few Kilometers to the east. Additional fossil pelvises known from the Plio-Pleistocene of Africa include the 2.8-2.5 Ma *Australopithecus africanus* (Sts14) from South Africa, and the *Homo erectus* juvenile male partial skeleton known as the “Turkana Boy,” (KNM-WT 15000, also sometimes known as the “Nariokotome Boy”) from Kenya dated to 1.53 Ma. Besides the Turkana Boy, few other pelvises are known from this important period of human evolution. Because of the lack of a female pelvis in the paleontological record before this discovery, scientists relied heavily on information derived from the Turkana Boy, an important fossil that has been central for assessing the general morphology of female *Homo erectus* and for estimating female *Homo erectus* birth canal

dimensions. Based on the Turkana Boy, the female pelvis has been inferred to be small and it was speculated that the birth canal could accommodate a neonate with a brain size of ~230 ml. As a result, before the new Gona discovery, *Homo erectus* females were believed to have delivered developmentally immature offspring with rapid brain growth after birth, also requiring a significant amount of maternal care similar to that of modern humans.

### **The new *Homo erectus* pelvis from Gona**

The Busidima discovery includes a complete pelvis and last lumbar vertebra. It stands as the only complete and first female *Homo erectus* specimen known from the entire Early Pleistocene (dated between 1.80-78 Ma) of Africa. With this new discovery now we can confidently and accurately reconstruct female *Homo erectus* pelvis anatomy and draw important functional and behavioral conclusions. The Busidima pelvis is from a short-statured adult *Homo erectus* female. However, the individual's pelvis is obstetrically capacious and falls within modern female ranges. The size of the birth canal dimensions of a modern human female approximates the size of the head of their newborns making birth in humans difficult and often a traumatic process. Based on study of the relationships of modern human female birth canal and neonate head size, we estimate that the Busidima *Homo erectus* female was capable of delivering a baby with a maximal cranial capacity of 315 ml, which is 30% greater than previously estimated based on the incomplete juvenile male pelvis from Kenya (KNM-WT 15000). Modern humans at birth have a mean cranial circumference of ~347 mm (ranging between 320-370 mm, based on a large sample studied for this announcement publication) and we estimate that the Busidima pelvis is capable of birthing a neonate with a fetal head circumference of 318 mm, which is at the low end of modern human neonatal head circumference at birth. Modern human female pelvic inlet circumference averages ~385 mm compared to the ~353 mm that we estimate for the Busidima *Homo erectus* pelvis.

Our analysis indicates that the female *Homo erectus* pelvis was substantially larger than *Australopithecus*. The Busidima individual was of a small stature. Novel selective factors probably played a role resulting in a distinctive obstetric pelvis in *Homo erectus* allowing the delivery of large-brained offspring, and probably implying that aspects of the female pelvic shape in *Homo erectus* had evolved in response to increasing fetal brain size.

We conclude that *Homo erectus* may have experienced prenatal brain growth rate close to that of modern humans but with a slightly slower postnatal growth. Our study also suggests that the short-statured, broad-hipped Gona female *Homo erectus* pelvis is characteristic of temperate-adapted modern humans and not the tall narrow body form in *Homo erectus* formerly purported to have been an adaptation to tropical, semi-arid environments, and argued to signify 'endurance running' in this species. The paleoenvironmental reconstruction of upper Busidima suggests open grasslands with tree cover and water sources along the main tributaries of the ancient Awash River.

## **Gona's Contribution to Palaeoanthropology, Previous Major Discoveries**

Gona is known for the discovery of the oldest stone tools in the world dated to 2.6 Ma (published in *Nature* and announced in 1997). The multi-component large-scale Gona Project was launched in 1999 and the team discovered the oldest documented association between stone artifacts and broken animal bones, probably butchered by the first toolmakers (published in the *Journal of Human Evolution* and announced in 2003). Between 1999 and 2003 a large number of hominid specimens were discovered at Gona which were assigned to *Ardipithecus ramidus*, one of the earliest ancestors dated between 4.3-4.5 Ma (published in *Nature* and announced in 2005).

The *Homo erectus* pelvis published in the latest issue of *Science* (November 14, 2008) was discovered in 2001, and Dr. Semaw, a research scientist at the Stone Age Institute and CRAFT Indiana University, and the leader of the Gona Project said that “The new *Homo erectus* female pelvis from Gona is very important because such anatomical completeness is very rare in the hominid fossil record. To date much of the Plio-Pleistocene fossil record is made up of crania and dentitions, and we know very little about the anatomical evolution of our ancestors below the neck. Gona has, for the first time yielded important information that is critical for understanding the pelvic morphology of a female *Homo erectus*, our immediate ancestor dated to around 1.2 Ma. Although no cranial specimens are associated with the pelvis, *Homo erectus* is the only hominid known at this time horizon in the Afar rift. In addition, Acheulian handaxes made by *Homo erectus* are known in the Busdima deposits. Thus, the new evidence clearly shows that *Homo erectus* females were capable of delivering larger brained babies than previously known.”

Dr. Simpson, the anatomist on the project said, “Understanding the anatomy of our ancient ancestors is the essential first step to reconstructing their behavior. This pelvis provides significant evidence about obstetrics, stature and body shape in *Homo erectus* females. We now know that differences in male and female stature were greater than previously documented, and that this species had substantially wider pelvises than modern humans indicating that previous models of locomotion and environmental adaptations in this species must be revised. With the recovery of this pelvis, *Homo erectus* will never look the same again.”

Dr. Semaw added that “Scientists for a long time projected a smaller brain for *Homo erectus* newborns based on measurements derived from an incomplete juvenile male pelvis from Kenya. Gona has yielded important information on several critical time periods in human evolution, including the first stone tools in the world, and now the new pelvis discovery providing the first accurate estimate of the size of the birth canal dimensions of female *Homo erectus*, which in turn accurately reflects the size of the brain of their newborns.”

Dr. Simpson states that “To understand the unique adaptations of modern humans, we must examine the fossil record to identify the origins of these traits. *Homo erectus* was the human ancestor that made the most remarkable increase in brain size, nearly doubling it in about one million years. With this pelvis, we can show that changes in brain growth occurred very early in our fetal development indicating that significant anatomical and behavioral changes were occurring at this time.”

## **Support**

The research permit for the fieldwork in the Afar and for laboratory work was granted by the Ethiopian Ministry of Culture and Tourism, Authority for Research and Conservation of Cultural Heritage and the National Museum of Ethiopia, and the Afar Culture and Education Bureau. Friends of CRAFT, the Stone Age Institute, and CRAFT Research Center, Indiana University supported all aspects of this research. A large portion of the fieldwork was supported by a major funding from the L.S.B. Leakey Foundation. Additional support was provided by the National Science Foundation, the Wenner-Gren Foundation and the National Geographic Society. We owe the success of the fieldwork to our Afar colleagues at Eloha and Gona area.

## **Description and Dating of the New Discovery**

The pelvis was reconstructed, analyzed and described by Dr. Scott Simpson, the project Physical Anthropologist. The geological studies were carried out by Drs Jay Quade and Naomi Levin.

## **For details of the anatomical evidence contact:**

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**For images of the new discovery visit: [www.stoneageinstitute.org](http://www.stoneageinstitute.org)**

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