Discovered in 1994 in Aramis, Ethiopia, “Ardi” became what is thought to be the most completed version of the oldest humanoid skeleton. At 4.4 million years old, the fossils found contained most of the skull and jaw bones, along with the pelvis, hands and feet. These remaining fossils of the creature named *Ardipithecus ramidus* allows researchers to make comparisons to current humans and other species, such as chimpanzees and apes. It is known that Ardi had a slightly larger body and brain size as that of chimpanzees, but that its way of movement was different. Overall, Ardi shared a body shape more similar to apes, but a number of significant features set them apart. Unlike apes that will knuckle walk or swing in trees, the short, wide pelvis and the stiff foot indicated that Ardi likely walked upright, but not completely in the same way as humans (Gibbons, 2009). The presence of an opposable big toe in Ardi’s fossils showed that she spent a lot of time in trees, likely to reach food, sleep in nests and to stay out of reach of predators, and her foot shows that it was used for walking both on the ground and atop branches in trees. Her feet also differed from modern humans in that they lacked arches, meaning this species likely couldn't walk long distances (Dorey, 2018). This characteristic of the pelvis made Ardi a “facultative” biped, since she both climbed and walked upright. Features of Ardi that are similar to later hominins were found in her skull, with her muzzle jutting out less than that of chimpanzee, and the lack of large, dagger-like canines also seen with chimps. Along with that, the base of her skull was short from front to back, which is similar to those of upright walkers. Her skill also rests atop of the spinal column, another indication that the species was bipedal (Dorey, 2018). Ardi’s pelvis compared to later hominins, such as modern humans, share the sciatic notch, which is a large opening that allows certain nerves and muscles to pass through. Her pelvis was also characterized by large flaring bones of the upper pelvis, which allowed her to walk on two legs without lurching side to side like a chimp would, but her lower pelvis was similar to that of an ape, and did not face upward like in humans, which would help with the larger hind limb muscles used for climbing (Shreeve, 2021). The broader upper blades of the pelvis also lowered her center of gravity, allowing her to balance one on leg, giving her the ability to walk. Her pelvis also indicated that she likey had a long and curved spin similar to a human's (Gibbons, 2009). There are also similarities in Ardi’s hand bones, with wrist bones that displayed flexibility, particularly in the midcarpal joint, and short palm bones, indicating that her species was not a knuckle-walker (Dorey, 2018). As for Ardi’s similarities to modern humans based on her skeleton and skull, there is some controversy. Some argue that the ability to

walk-upright is what classifies one as a hominin, but since she climbed and walked, it makes it harder to identify her as one. Others argue that the features in one skull, face and teeth define one as hominin, which would then make Ardi belong (Gibbons, 2009).

In comparison to Lucy, there are a few features that set the two apart. Once thought to be the oldest humanoid, Lucy was discovered 3.2 million years ago in Ethiopia and belongs to the species *Australopithecus afarensis*. One feature that makes Lucy and Ardi similar is that they are both thought to walk on two feet, however scientists agree that Lucy was much better at it then Ardi. With Lucy's skeleton, her feet are characterized by arches and wide heels, along with big toes aligned with other toes, as compared to Ardi's lack of them (Dorey, 2021). Ardi's skeleton indicates that she was much more primitive than Lucy, but her face and teeth have deprived features that tie her species back to Lucy's species and all later hominins, including us (Gibbons, 2009). Along with that, Lucy's skeleton and anatomy was more similar to that of living apes and later hominins, whereas Ardi's were not. Lucy's skeleton also lacked the opposable toe that allowed for the grasping of tree limbs, however, her skeleton still showed signs of tree life, such as similar curved fingers and toes, along with shoulder joints and long forearms (Dorey, 2021). Lucy's pelvis was also more human-like than Ardi's, it was short and wide but it still lacked the necessary components to allow for a smooth gait. Lucy also had teeth that were an intermediate between those of humans and apes, with a jaw that was long and narrow, while Ardi's teeth were relatively large like an ape, and had diamond shaped upper canines. As for the skull of both species, Lucy's spinal cord came from the central part of the skull rather than from the back, similar to Ardi where the short cranial base indicated the head rested on top of the spine (Dorey, 2021).

In terms of evolution of humans based on Lucy and Ardi, there are challenges when it comes to determining how Ardi is related to modern humans and to Lucy. Some argue that *Ardipithecus* gave rise to *Australopithecus*, which eventually led the modern human genus of *Homo,* while others argue Ardi could have also been a side branch of a sister species to the *Homo* species (Gibbons, 2009). It is likely that evolution in humans resulted in a transition from living in trees to the ground in order to obtain resources or due to competition. There may have also been a change in habitat, where those belonging to Ardi's species were surrounded by more woods, while those belonging to Lucy's species had more open and grassy terrain. However, the presence of both the opposable toe and the ability to walk suggests that Ardi may have started

walking upright while still surrounded by trees. Humans likely evolved as a result of cohabitation with other species that led them needing to get food and resources that weren't available in trees, leading them to taking their first steps 4.4 million years ago. From obtaining an arch in their feet to a pelvic bone made for balance and longer strides, humans likely had to travel further for resources and started to evolve to help obtain them. Since many traits come as adaptations to fill specific niches, the evolution of humans likely comes as a result of needing to find a new niche, which may have meant needing new modes of travel that saved energy or to possibly have free hands instead of walking on all four.

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