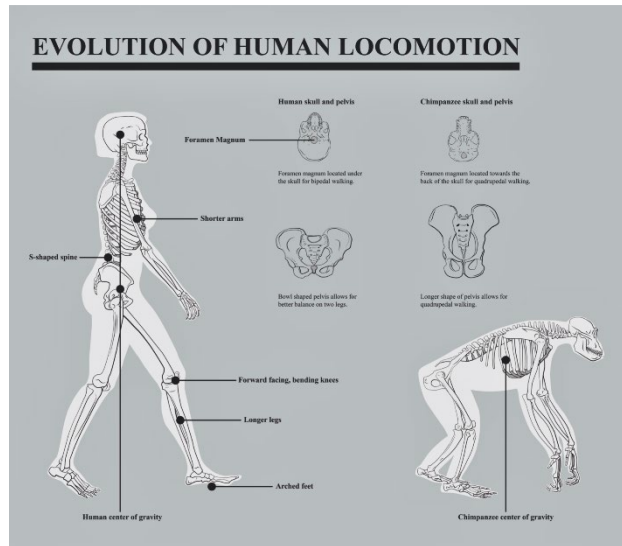


Bipedalism

One of the earliest traits that our human ancestors developed was the ability to walk upright – bipedalism. This trait may have developed as long as 6 million years ago! Our closest living relative, the chimpanzee, is primarily quadrupedal – walking on four limbs. Chimpanzees are adapted to climb and swing in trees. Humans are adapted for walking upright on the ground. The last common ancestor of humans and chimpanzees probably had a combination of bipedal and quadrupedal traits. We can understand how adaptations for bipedalism evolved by looking at and comparing anatomical structures among chimpanzees, our early human ancestors and modern day humans.



Visit this website to explore the anatomical structures that suggest bipedalism.

<https://humanorigins.si.edu/human-characteristics/walking-upright>

Focus on:

1. The position of the skull where the spine connects
2. The size, shape and position of the pelvis – hip bones
3. The length and position of the upper leg bone – femur

Then, visit this website to explore the anatomical structures that suggest bipedalism.

<https://www.amnh.org/exhibitions/permanent/human-origins/meet-the-relatives>

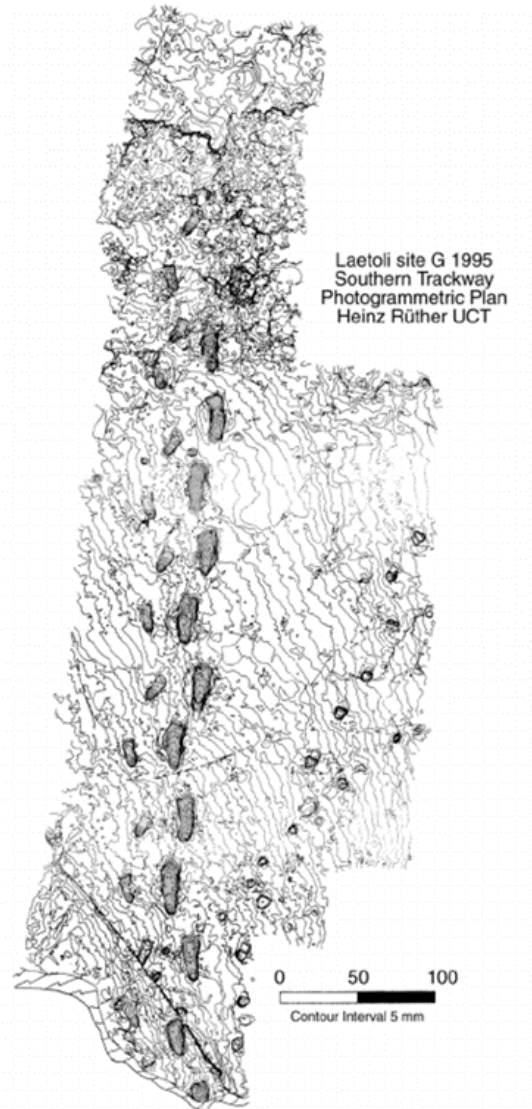
Focus on:

1. The position of the skull where the spine connects
2. The size, shape and position of pelvis – hip bones
3. The length and position of the upper leg bone – femur
4. The foot anatomy

Collectively, looking at these traits give us a lot of information about the evolution of human locomotion. There is other evidence we can look to as well. In the form of fossilized footprints.

Footprints

Footprints are another clue to suggest a creature walks upright. Fossilized footprints can tell the story of how locomotion occurred millions of years ago. Watch this [animation](#) to learn the story of how the footprints made by our early ancestor *Australopithecus afarensis* show how they walked in eastern Africa millions of years ago. Check out the fossils [here](#) and in the illustration below.



[A photogrammetric plan of the Laetoli site G](#)

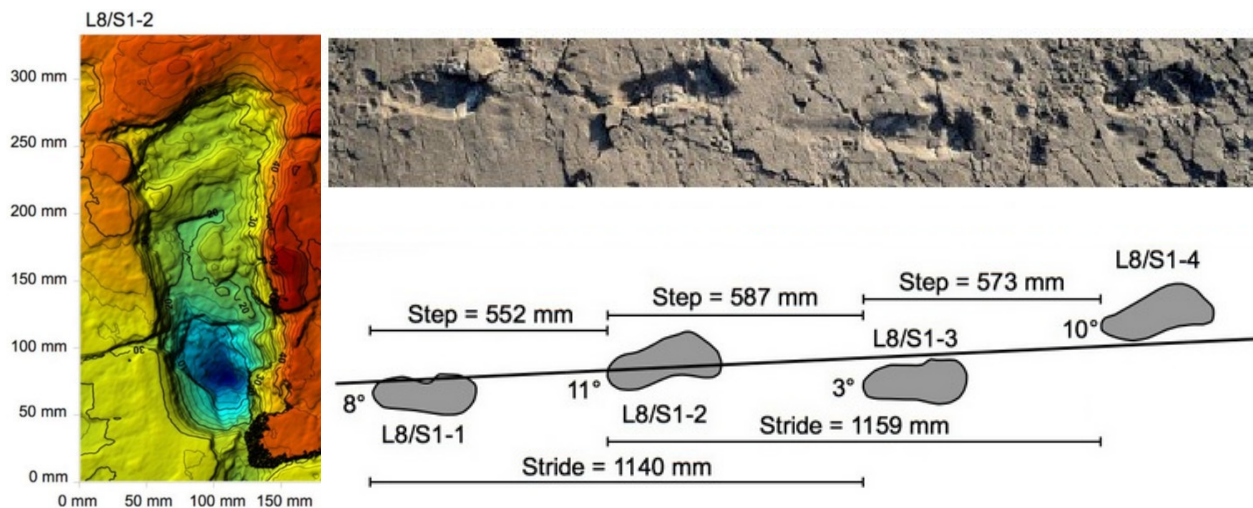
Make Your Own Trackway

For this activity, you will need:

- an outside space such as a sidewalk or driveway
- sidewalk chalk of two colors
- a measuring device such as a ruler or measuring tape

1. To start making your trackway, place your left foot out in front of you and trace it with chalk. Get a partner to help you out.
2. Without moving the foot you just traced, put your right foot forward as if you were going to take a step. Pause and trace where it landed. Repeat for a few more steps or until you feel your trackway is complete.
3. Switch with your partner and do the same thing in a different color chalk.
4. Now, use a ruler or measuring tape to record your observations, measure your:
 - foot length from the furthest point along the toes to the back of your heel.
 - step length from the heel of one foot to the heel of the next foot.
 - stride length by starting at the heel of your left foot and measuring to the heel of your next left foot, skipping the step you took in between.
 - leg length from your ankle to hip.

Use the diagram below of the footprint and Laetoli trackway as a guide.



<https://commons.wikimedia.org/wiki/File:LaetoliS1prints4TC.jpg>

Compare and contrast your observations

Observations	Person 1	Person 2
Foot Length		
Step Length		
Stride Length		
Leg Length		

What do we learn from footprints?

If you were running, describe how that would change your trackway?

Where did you feel the most pressure when you stepped down? Your toe, or heel? What part of your foot hits the ground first? Leaves the ground last?

Can you tell whether the footprint makers were tall or short or how old they were? How do you know?

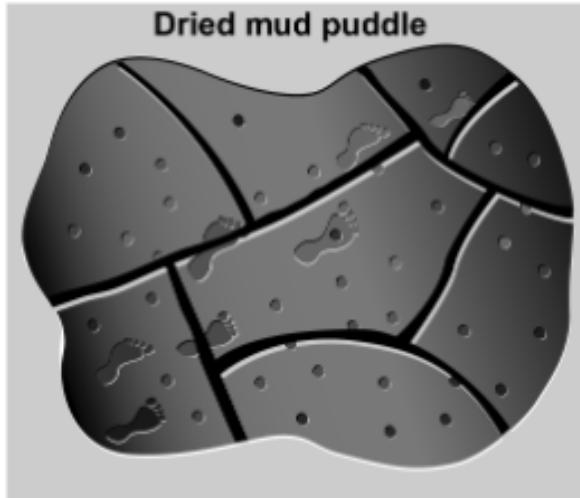
Convert your observations to millimeters (mm) and compare your measurements to *Australopithecus afarensis* (Lucy). How is your foot similar or different?

Compare more of your features to Lucy at: <https://elucy.org/compart/>

Write Your Own Story of Footprints!

Sequencing events after a thunderstorm (adapted from Crazy Traits – CPO Science)

Carefully examine this illustration. It contains evidence of the following events:

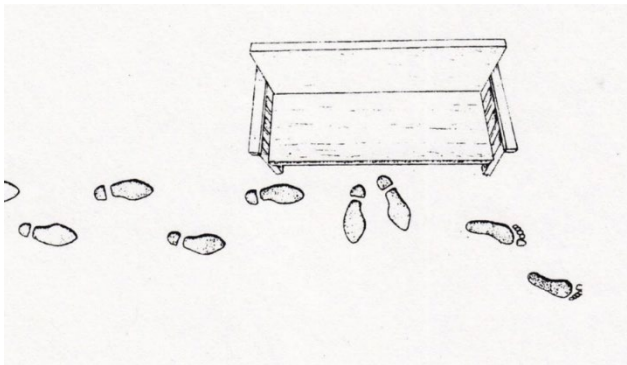


- The baking heat of the sun caused cracks to form in the dried mud puddle
 - A thunderstorm began
 - The mud puddle dried
 - A child ran through the mud puddle
 - Hailstones fell during the thunderstorm
1. From the clues in the illustration, sequence the events listed above in the order in which they happened.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 2. Write a brief story that explains the appearance of the dried mud puddle and includes all the events. In your story, justify the order of the events.

Using what you've learned, infer what you think happened in these photos.







Resources:

Walking Upright – Smithsonian National Museum of Natural History
<https://humanorigins.si.edu/human-characteristics/walking-upright>

Footprints – Smithsonian National Museum of Natural History
<https://humanorigins.si.edu/evidence/behavior/footprints>

Laetoli Footprints – PBS LearningMedia
<https://www.pbslearningmedia.org/resource/tdc02.sci.life.evo.laetolifoot/laetoli-footprints/>

Step by Step: The Evolution of Bipedalism, intermediate and advanced lesson plan from eLucy.org
https://elucy.org/wp-content/uploads/2016/02/lesson_step_by_step.pdf

Information, student activities and teacher lessons on the “Lucy” fossil
<https://elucy.org/>

Becoming Human.org – Interactive multimedia and scholarship on the origins of humans
<http://www.becominghuman.org/>

Human Feet Are Strange – Howard Hughes Medical Institute (HHMI) lesson plan on bipedalism
<https://www.biointeractive.org/classroom-resources/human-feet-are-strange>

Introduction to Bipedalism – eFossils
<http://efossils.org/book/introduction-bipedalism>

Laetoli Footprints: Protecting Traces of our Earliest Ancestors – Getty Conservation Institute
https://www.youtube.com/watch?v=0EZi_EAYloQ

Sequencing events after a thunderstorm answer key:

- a. A thunderstorm began
- b. A child ran through the mud puddle
- c. Hailstones fell during the thunderstorm
- d. The mud puddle dried
- e. The baking heat of the sun caused cracks to form in the dried mud puddle



Lulu fascinated by fossilized footprints!