

Activity: Can You Identify Activity Patterns?

Some occupations and habits modify skeletons because bones change size and shape in response to forces exerted on them. The bones of body builders show well-developed ridges where muscles are attached. The hips and knees of runners may develop joint deterioration. The right arm bones of someone who is right-handed may be larger than the left. Generally, pinpointing a task that caused a particular bone formation is not possible. However, the basic movement and degree of labor of a task can be determined. Repetitive, heavy use of certain muscles can affect the bones to which they are attached. The bone may thicken, modify in shape, or become roughened where the muscles connect. Similarly, inactivity can cause bone loss, or atrophy.

Figure 1 shows upper arm bones of two adults. The humerus on the left is from a young female. The humerus on the right is from an older male. The male humerus is larger and has greater evidence of heavy physical labor involving the upper arms.

Both the left and right humeri of the same male show defined bony ridges (i.e., roughened bone) and crests where the muscles of the upper arm were attached.



Figure 1. Female (left) and male (right) humeri.
(Source: Smithsonian Institution)



Figure 2. Male left and right humeri.
(Source: Smithsonian Institution)

Rather than causing bony ridges where muscles attach, heavy labor in young people can result in cortical excavations (pits in the outer surface of bone). The humerus on the right in Figure 3 has a cortical bone

excavation. The bone on the left is normal with a smooth outer surface.

Bony changes in the spinal column also reflect excessive physical strain and activity. Traumatic and heavy lifting can compress the spine, producing hollowed depressions (known as Schmorl's nodes) in the vertebrae, as the tissue cushioning the disks bulges into the bone. The vertebra on the right in Figure 4 shows an endplate cavity caused by compression of the spine. The vertebra on the left is normal without evidence of disk compression.



Figure 3. Two juvenile humeri, normal (left), cortical excavation from heavy labor (right).
(Source: Smithsonian Institution)



Figure 4. Two vertebrae, normal (left) and with Schmorl's nodes (right).
(Source: Smithsonian Institution)

Labor or Leisure in the Skeleton in the Cellar?



Figures 5 and 6. Left and right clavicles (collarbone) of the skeleton in the cellar.

Notes from the forensic report of the skeleton in the cellar: *The inferior surfaces of the clavicles have deep cortical excavations at the attachment sites for the subclavius muscles and costoclavicular ligaments. These excavations extend from the medial ends of the bones onto the shafts for approximately 30 mm with widths of approximately 9 mm and depths that range from 2 to 4 mm.*



Figures 7 and 8. Humerus and distal humerus of the skeleton in the cellar.
(Source: Smithsonian Institution)

The proximal humeri exhibit roughened attachment sites for teres major, latissimus dorsi, and pectoralis major. Cortical excavations are present at the attachments for teres major with the left side being more pronounced. This excavation measures approximately 25 mm superior-inferior by 8 mm across, and 1.5 mm in depth.

The ulnae and radii have roughened and thickened crests. The anterior and medial surfaces of the right ulna shaft are especially roughened.



Figures 9 and 10. Left and right proximal ulnae and ulnar shaft. (Source: Smithsonian Institution)

Eight thoracic vertebrae and three lumbar vertebrae have Schmorl's depressions in their proximal and/or inferior endplates.



**Figure 11. Vertebrae series from the skeleton in the cellar spine.
(Source: Smithsonian Institution)**

What do you think?

Are the bones of the skeleton in the cellar normal or do they reveal excessive physical strain and trauma?

- None
- Light
- Medium
- Heavy

Vote



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This page is part of the Smithsonian's [The Secret in the Cellar Webcomic](#), an educational resource from the [Written in Bone](#) exhibition, February 2009 - 2011.