Forensic anthropology

Skeletons are crime's mute witnesses, and it is the job of the forensic anthropologist to make dry bones talk. By careful examination, including measurement and comparison, specialists can determine the age, gender, stature, and ethnicity of human remains. Often the bones can reveal much more, including medical history and manner of death.

When bones are discovered—either by chance or because they are unearthed in a police investigation—it is the job of the forensic anthropologist to help identify the victim, and determine whether the death was crime-related. The first step is to find out whether the bones are human. This sounds strange, but bones of certain animals can resemble a range of human bones. For example, a horse's tail bones look similar to human finger bones.

Age at time of death

Next, the age of the victim is assessed by examining the growth and decay of certain bones. Emerging teeth, for example, can help determine the age of a child's skeleton, from the first milk teeth up to about age 18, when wisdom teeth often appear.

Throughout the teenage years, children's bones become denser and bigger, uniting in a process called "ossification." The 800 centers of ossification in the body are among the best guides to the age of a youngster's skeleton. For example, by age six, two bony plates called epiphyses have formed at either end of the outer forearm (radius). By up to age 17 for males and 20 for females, the lower epiphysis and radius have fused. The upper epiphysis and radius fuse soon after.

A VIOLENT DEATH ▲
The hole in the skull suggests blunt-force injury a cause of death. These are the remains of some murdered during Argentina's military rule, 1976

The last of the bones to finish growing the collarbone, at up to 28 years of age

In the skeletons of older people the anthropologist looks for degeneration. Tiny spikes of bone begin to appear around the edges of the vertebrae; the teeth wear down; and joints may show signs of arthritis. All this deterioration increases with age.

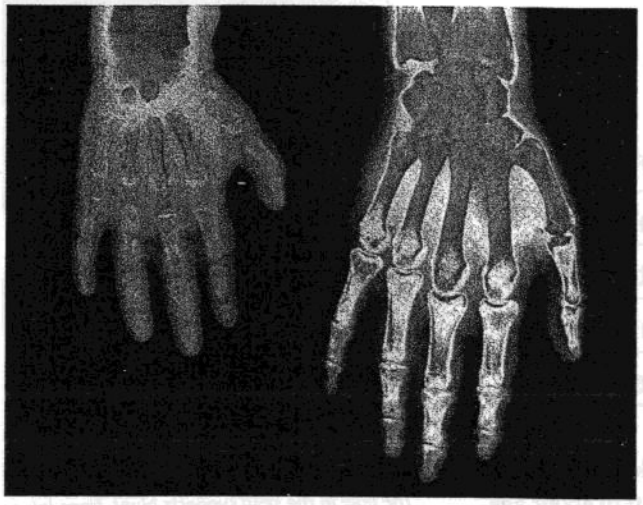
Marks of gender

To distinguish male from female anthropologists look first at the skull a hips. Clues to sex are at three points on the skull: the ridge above the eyes, a bo

READING THE BONES

1. *Facial injuries like this are strongly suggestive of brutal homicide.*
2. *The thigh bone (femur) is the longest bone in the body, and gives a good indication of body height.*
3. *The pelvis can determine sex even when damaged or incomplete.*
4. *Crushed vertebrae can indicate osteoporosis—a condition that mainly affects older women.*

EXAMINATION OF A CZAR
The exhumed bones of the last Russian czar, Nicholas II, his wife the czarina, and her chambermaid, Anna Demidova, are examined in a Russian forensics lab in 1998.



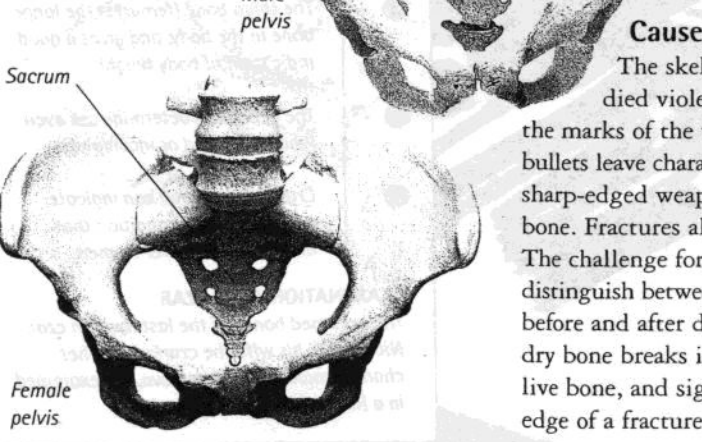
◀ AGE DETERMINATION
These hand X-rays from a three-year-old and an adult show the process of ossification. Wide spaces of cartilage in the child's hand have been replaced by bone in the adult's.

below the ear, and the occiput—the bone at the lower back of the skull. The latter two are muscle attachment sites, and all are more prominent in men.

The difference in the hips is clear even to laypeople: men's are substantially narrower, but there are more subtle differences as well, as shown below.

If the skeleton includes neither hips nor skull, establishing sex is much more difficult. Anthropologists are forced to rely on the difference in size and strength between men and women. In skeletons of males, the points on the bones to which muscles are attached are more pronounced, indicating greater strength.

BUILT FOR BABIES
Because women's pelvises are built to accommodate babies, they are visibly wider than men's. The female sacrum—the wedge-shaped bone consisting of five fused vertebrae—is wider too, and the cavity is roomier.



How tall?

The most straightforward way of estimating height is to assemble the skeleton, or total the length of the relevant bones. Adding 4 in (10–11 cm) accounts for the missing connective tissue in adults—more for children, depending on age. If the skeleton is incomplete, individual bones are a guide to stature. The longer the bone, the better the estimate, so the thigh bone (femur) is usually measured first. Most people measure two-and-two-thirds times their femur length, though the precise ratios depend on race and sex.

Diseases and injury in life

In life, some medical conditions, including birth defects such as spina bifida, a few infectious diseases, inadequate diet, and cancers, can damage the bones. However, only chronic cases have any noticeable impact on the skeleton. This is not true of injury: when broken bones heal, the mending process is clearly visible, so a healed fracture can help confirm identity.

Work can leave clues, too: occupational arthritis causes easily visible changes to the affected joints.

Cause of death

The skeletons of people who died violently frequently bear the marks of the weapon that killed them: bullets leave characteristic holes, and sharp-edged weapons cut and chip the bone. Fractures also suggest violence. The challenge for the anthropologist is to distinguish between fractures that occurred before and after death. There are clues: dry bone breaks in a different way from live bone, and signs of early healing at the edge of a fracture indicate injuries in life.

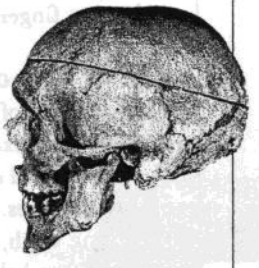
DETERMINING ETHNICITY

The racial origins of a body are a crucial clue in establishing identity. It is the skull that provides this information. When studying a skull to determine ethnicity, anthropologists look for some of these key features:

MONGOLOID ▶
People of Asian descent have long skulls, broad and conspicuously flat faces, and projecting cheekbones. The eye sockets are rounded, and the nose bridge is moderately low with straight sides.

NEGROID ▶
Afro-Caribbean skulls are recognizable by the wide nose opening. Teeth are larger than other races, and the skull tends to be long and narrow. Cheekbones project moderately.

CAUCASOID ▶
The skulls of white people are generally high and wide in appearance. The cheekbones do not project, nor does the jaw—it falls behind a line dropped vertically from the forehead.



ARTHRITIC ELBOW ▼
The elbow joint of a worker who operated a hammer drill shows signs of arthritis in this X-ray. The bone ends, normally smooth, have been roughened by the constant shock of the pneumatic tool.