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English

No. 5911

True to Life Human X-rays®

Explore the skeleton of a virtual person with x-rays that look and feel real!

The skeleton forms the architecture of our bodies. Our bones are growing, living tissue that protect our organs, support our muscles and allow us to move delicately and energetically while manufacturing blood cells and storing minerals. Bones are made mostly of calcium, which is found in milk and other foods. X-rays allow us to see inside the body and examine our bones. Let's learn more about the skeleton and the x-ray process!

We've computer enhanced real x-rays to create the skeletal system of a young adult 5' (1.5 m) tall. Start your exploration on a light table or white table top. Alternatively, hold the x-rays up to the light or against a window. Display the x-rays on an overhead projector during classroom discussions. Use the reproducible chart as an individual reference or testing tool. Create an artistic representation of the skeleton! Use the "True to Life" skeleton as a reference and draw pictures of people after examining the size of the head, length of the arms and the position of the eyes and nose, etc. Let's get started!

X-rays were accidentally discovered over 100 years ago by German scientist William Roentgen. At that time "x" was used in science to denote "unknown". Roentgen did not know what to call the new form of energy waves he discovered, so he called them x-rays.

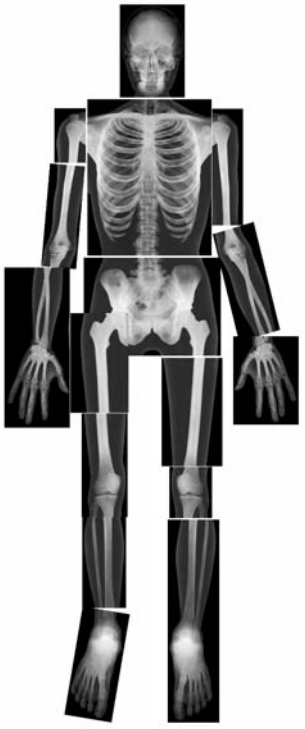
X-rays are an invisible form of energy traveling at very high frequency at the speed of light. Unlike visible light, which can only pass through transparent materials like glass and water, x-rays can also pass through soft materials like clothing, skin, and muscle to varying degrees. However, they cannot pass through hard materials like bone or metal.

An x-ray machine is basically very simple. On one side, an x-ray emitter shoots out a very short burst of focused x-rays. On the other end is a sheet of unexposed film that the x-rays hit. A person stands between the x-ray emitter and a machine holding the undeveloped film. Different tissues in your body have different x-ray opacities. For instance, when the x-rays hit hard materials like bone, they are blocked and the film, after it is developed, appears clear or white. When the x-rays pass through very soft materials like clothing and hair, they pass easily through and these areas appear black on the developed film. When the x-rays pass through various soft materials like skin, organs and muscles, they produce various shades of gray on the developed film.

Let's explore x-ray opacity! Sort your students into groups. Give each group 1 - 3 x-rays and ask them to identify different areas of opacity. Dark areas of the film indicate that x-rays have passed through air or very soft materials like clothing. Clear/white or light gray areas means the x-rays have been blocked by hard materials like bones. In their x-rays, ask students to identify skin, soft tissue and bones based on x-ray opacity.

X-rays are very useful in medicine. Doctors and specialists use x-rays to see if people have broken bones, certain forms of cancer and other abnormalities like dental cavities and foreign objects in the digestive tract. To reveal objects or tumors that are relatively soft, technicians can use iodine, a radio-opaque compound that is either injected into the patient or that they swallow. These compounds flow through the body and come to rest in tumors, where they show up on the x-ray film. Dentists use x-rays to check teeth for cavities. Veterinarians can check animals for broken bones or ingested fish hooks!

We have printed these x-rays onto heavy plastic. Doctors and x-ray technicians handle only the edges of the x-rays to prevent marking the film. You can teach your students this technique or you can laminate each x-ray to avoid scratches.



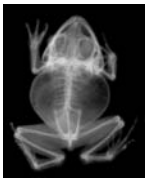
Introduce the whole skeleton to your students. Each piece of film is printed with a small icon indicating where the x-ray is located relative to the entire skeleton. Lay several large white sheets of paper on the floor to form a rectangle approximately 5' 6" (1.7 m) long by 3' (1 m) wide. Ask individuals or groups to sort through the x-rays and arrange them on the white sheets to create a full-sized skeleton. Once the skeleton is arranged, ask students to identify parts of the body: head, arms, legs, feet, ankles, neck, teeth, eye sockets, etc. Photocopy the bone labels and cut out each word. Make photocopies of the skeleton chart for your students. Cut the sheet in half. Give the students the labels and the skeleton chart indicating where the labels go. Ask students to label their skeleton using the chart as a reference. Later, use the blank chart to test students.

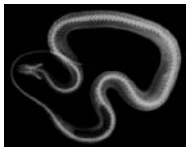
Count the number of bones in the skeleton. When we are born, we have about 300 bones, but as we grow some of these bones fuse together and we end up with 206. The hardest to find are the tiny stirrup bones inside the ear.

Compare and contrast bone structures. Start with the hand and foot. Examine the structures and count the bones. Describe what the two x-rays have in common and how they differ. Repeat this exercise with the forearm and lower leg, knee and elbow, shoulder and hip.

Explore the purpose of different bones. Bones give our muscles structure so we can move. They also protect our delicate organs. Look at the hands or spine. How do they allow us to move? How do they restrict our movement? Examine the rib cage and skull and discuss the roles they play in protecting our organs.

It is fun to examine the human skeleton in relation to animal skeletons. Roylco makes a set of Animal Skeletons that you can use to introduce the similarities and differences between animals.





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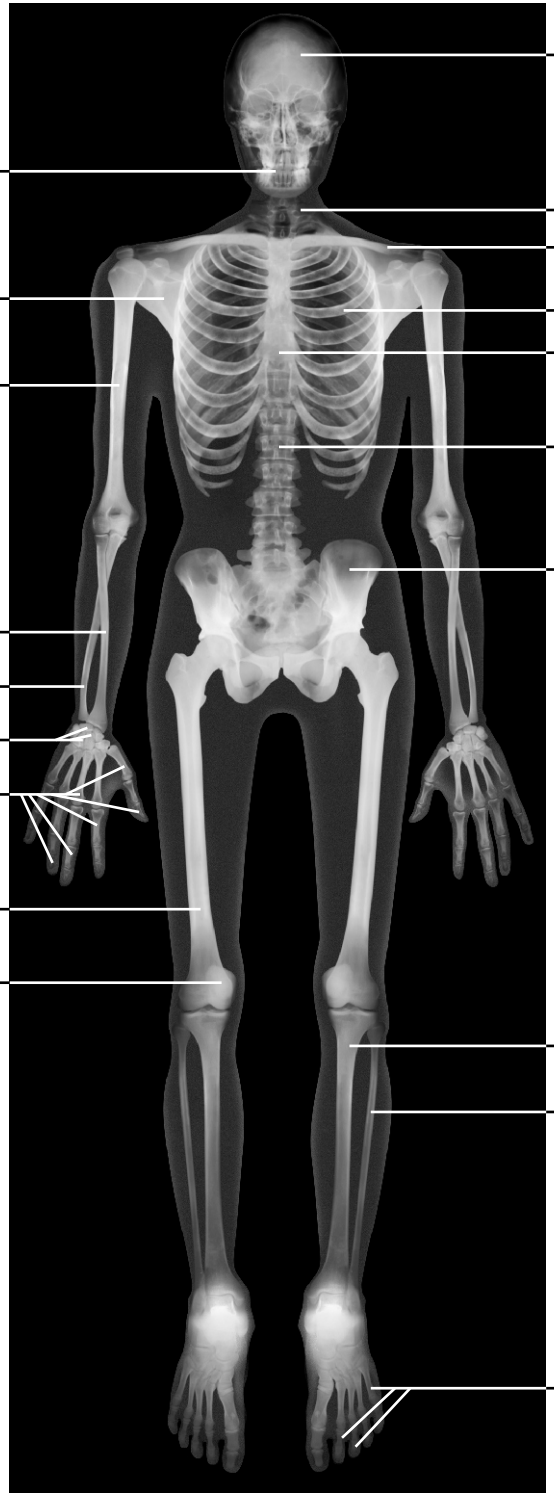
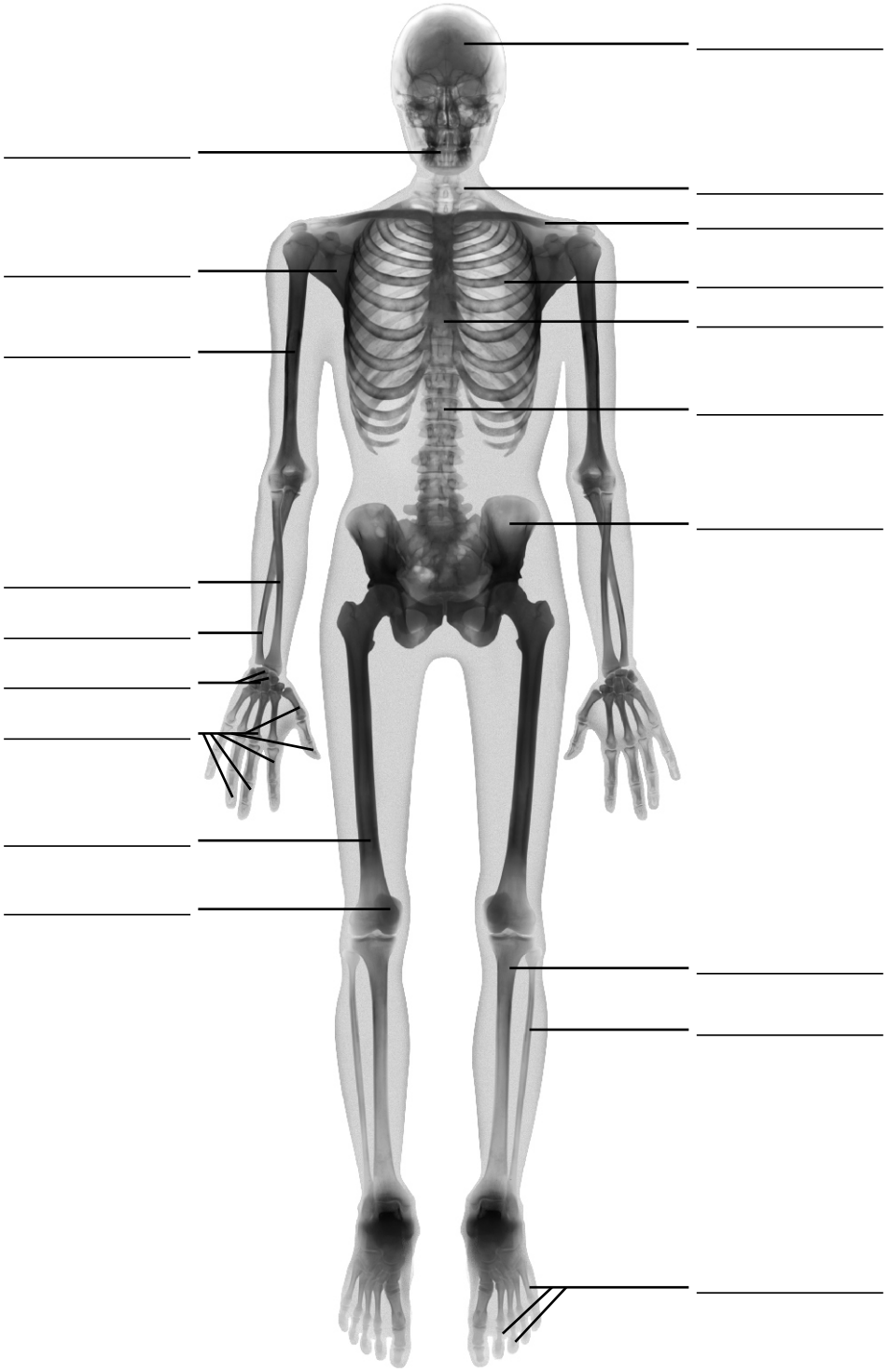
English

scapula	skull	clavicle
rib cage	ulna	patella
sternum	tibia	carpus
humerus		femur
phalanges		radius
phalanges		fibula
neck vertebrae		pelvis
spinal vertebrae		teeth

English



skull
teeth
neck vertebrae
clavicle
scapula
rib cage
sternum
humerus
spinal vertebrae
pelvis
radius
ulna
carpus
phalanges
femur
patella
tibia
fibula
phalanges



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