NO PREP

Bones, DNA & Forensic Archaeology

An Overview

Includes: Student reading, case study, differentiated questions, teacher key

Name: Period: Date:

Bones, DNA & Forensic Archaeology: An Overview

More Than Just Bones

When most people think about archaeology, they picture ancient pottery, buried temples, or golden treasures. But some of the most powerful evidence from the past comes not from objects at all — it comes from people. Human remains, when studied carefully, can reveal things no artifact ever could: what someone ate, where they grew up, what diseases they survived, how they died, and even who their living relatives might be. The scientific study of human skeletal remains in their archaeological context is called bioarchaeology, and it sits at the intersection of biology, anthropology, and history. Bioarchaeology is not the

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The Science of Reading the Dead

Forensic anthropology is a closely related field, but it is oriented toward legal and criminal contexts rather than historical ones. Where a bioarchaeologist might study a medieval burial to understand population health, a forensic anthropologist is more likely to be called to a crime scene or disaster site to help identify victims. Both fields use the same fundamental skills (reading bone morphology, estimating age at death, determining biological sex), but their purposes and contexts are different. In some cases, the fields overlap significantly: when archaeologists excavate historic mass graves from wars or genocides, forensic anthropologists are often part of the

team. Osteology, the scientific study of bones, underlies both disciplines. The human skeleton contains 206 bones in adults, and each one carries information. The density of bone changes with age. The shape of certain bones differs between biological sexes. The surfaces where muscles attach show wear patterns that reveal lifetime labor habits. Growth plates fuse at predictable ages. A trained osteologist can look at a skeleton and produce a biological profile that includes estimated age, sex, height, ancestry, and a list of health conditions, all without a single written record.

Ancient DNA: A Revolution in Progress

The newest and perhaps most dramatic tool in the study of human remains is ancient DNA, often abbreviated aDNA. Preserved fragments of genetic material can sometimes be extracted from bones and teeth that are thousands of years old, and when they can, the results are often stunning. Ancient DNA has revealed that modern Europeans are descended from at least three distinct ancestral populations. It confirmed that Neanderthals and modern humans interbred. It showed that the first Americans came from Siberia in multiple migration waves. It even identified entirely new human relatives, the Denisovans, from a single finger bone found in a Siberian cave. Ancient DNA analysis has transformed archaeology from a field that reconstructed the past from objects into one that can directly read the genetic code of the people who made them. But it is not magic. DNA degrades rapidly, especially in warm or wet conditions. Contamination from modern DNA is a constant risk. Only a fraction of ancient specimens preserve usable genetic material, and even when DNA is recovered, interpreting what it means requires careful statistical analysis. The field is moving fast, and its findings sometimes overturn long-held assumptions, which makes it exciting, but also means scientists must interpret results with caution.

Ethics at the Grave

The study of human remains is not purely a scientific enterprise. It raises profound ethical questions about who has the right to disturb, analyze, and keep the dead. In the United States, the Native American Graves Protection and Repatriation Act (NAGPRA), passed in 1990, requires federally funded institutions to return Native American human remains and sacred objects to affiliated tribes. Similar laws exist in other countries. But implementation is uneven, and debates continue about when scientific value justifies study versus when the wishes of descendant communities

should take precedence. Museums around the world still hold thousands of sets of human remains collected under colonial-era conditions that would be considered unethical today. Some institutions have moved proactively to repatriate remains. Others have resisted, arguing that removing specimens from scientific collections will permanently close off research possibilities. Indigenous communities, for their part, often point out that the question is not just scientific but spiritual and cultural — the dead belong with their people, not in storage drawers. There are no easy answers, and the field of bioarchaeology continues to grapple with these tensions as it advances scientifically.

Key Information: Bones, DNA & Forensic Archaeology Overview

Detail	Information
Bioarchaeology	Study of human skeletal remains in archaeological context; reconstructs life histories from bones
Forensic Anthropology	Applies osteological methods in legal/criminal contexts; identifies victims of crimes or disasters
Osteology	Scientific study of bones; the foundation of both bioarchaeology and forensic anthropology
Ancient DNA (aDNA)	Genetic material extracted from old bones/teeth; reveals migration, disease, and ancestry
Key aDNA discoveries	Denisovan human relatives, Neanderthal-modern human interbreeding, multi-wave American migration
NAGPRA (1990)	U.S. law requiring return of Native American remains and sacred objects to affiliated tribes
Ethical tension	Scientific study of remains vs. cultural/spiritual rights of descendant communities
Biological profile	Estimate of age, sex, height, ancestry, and health from skeletal analysis alone

Case Study: Maya's Discovery

Maya Kowalski is sixteen years old and spending spring break helping her parents renovate their century-old farmhouse in rural Ohio. On the third day, her father's shovel strikes something hard about two feet below the surface of the old root cellar floor. He brushes away the dirt and goes pale. It is clearly a bone — curved, yellowed, unmistakably human. The family calls the police. Within two hours, a county sheriff, a forensic anthropologist named Dr. Raymond Cole, and a representative from the county historical society are all standing in the cellar. Dr. Cole kneels and examines the bone without touching it. 'This isn't a crime scene,' he says quietly. 'Based on the color, density, and the soil matrix around it, this individual has been in the ground for at least 150 years. Possibly much longer.' Maya watches him work. She has been thinking about forensic science as a possible career, and she asks Dr. Cole what he can tell just from what he sees so far. He points to the curve of the bone. 'This is a femur — a thigh bone. The size and density suggest an adult, probably male. The degree of mineralization tells me it's old.' He pauses. 'But to know more — age at death, health, ancestry — we'd need to excavate properly and get this to a lab.' That night, Maya looks up NAGPRA on her phone. She wonders: if these remains turn out to be Indigenous, does her family have any say in what happens next? And should they?

1. Based on what Dr. Cole explains and what you read in the passage, what can skeletal remains reveal about a person's life — and what are the limits of that knowledge?

2. Maya wonders whether her family has any say in what happens to the remains if they are found to be Indigenous. Using the reading, explain what NAGPRA is and how it would apply to this situation.

Multiple Choice

1. What is bioarchaeology?

    a) The analysis of ancient pollen to reconstruct past environmental settings

    b) A branch of forensic science used in criminal investigations

    c) The scientific study of human skeletal remains in archaeological context

    d) The study of ancient DNA extracted from fossils

2. How does forensic anthropology differ from bioarchaeology?

    a) Bioarchaeology is limited to the study of ancient DNA and other genetic material taken from teeth

    b) Forensic anthropology studies only non-human animal remains

    c) Forensic anthropologists do not use osteological methods

    d) Forensic anthropology is oriented toward legal and criminal contexts rather than historical ones

3. What was significant about the Denisovan discovery mentioned in the reading?

    a) Denisovans were an entirely new human relative identified through DNA from a single finger bone

    b) Denisovans were the direct ancestors of all modern Europeans

    c) Denisovans were identified from a complete skeleton found in China

    d) Denisovan DNA proved conclusively that modern humans never interbred with other archaic species

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ Bioarchaeology	A) Genetic material extracted from old bones or teeth to study ancestry and migration
2. ___ Forensic anthropology	B) Human bones and teeth preserved at archaeological or crime scene sites
3. ___ Skeletal remains	C) Application of bone analysis methods in legal or criminal identification cases
4. ___ Ancient DNA (aDNA)	D) The scientific study of the structure and function of bones
5. ___ Osteology	E) Scientific study of human bones in archaeological contexts to reconstruct past lives

Fill-in-the-Blank

1. The scientific study of human skeletal remains in their archaeological context is called _____.

2. Scientists extract _____ from bones and teeth to learn about ancient migration and disease.

3. The U.S. law requiring federally funded institutions to return Native American remains to affiliated tribes is called _____.

Short Answer

Answer each question in 2-4 complete sentences.

1. How does forensic anthropology differ from bioarchaeology, and why does that distinction matter in practice?

2. Why might Indigenous communities object to the scientific study of ancestral remains, even when researchers have good intentions?

3. What is one way ancient DNA has changed our understanding of human history, and why is interpreting aDNA results still complicated?