

# Bone detectives



**ASSIGN  
BUSTER**

## **Introduction**

When we think of bones, we most often think of the way in which these hard structures support the body, how they work with muscles to produce movement and how they protect our internal organs. But the 206 bones of the human skeleton can also tell a story. The specific structure of your bones reveals information about your gender, your height, your age and even your ethnicity. These biological clues are often the first pieces of evidence scientists look to in identifying the remains of a missing person.

Specialists called forensic anthropologists are trained to analyze the secrets locked in a bone's shape and structure and can use this information to help solve crimes, trace human origins, or identify those who have gone missing. In this project, you will assume the role of a forensic anthropologist and complete a detailed examination of skeletal remains.

Forensic anthropologists use a combination of quantitative and qualitative measures to predict traits from bone. Through a series of metric measurements and direct observation, you will gather clues about the identity of the remains that have just been unearthed in a local park.

Last week, a young couple was out for an early morning run. Stopping to catch a drink, they stumbled upon what appeared to be a human skull. The police arrived at the scene and went on to unearth two skeletons lying side by side. With a huge backlog of missing person cases, the police are looking to you for answers. Who are these people lying forgotten in the park? Can these bones tell their story and finally provide closure to grieving families?

In this project, you and your team of forensic anthropologists have been called in to examine the skeletal remains. Through careful observation and measurement of the bones found at the scene, you will provide the local police department information that is vital to identifying these individuals.

You will analyze features of bone to determine as much as you can about each person's gender, ethnic origin, age and height. Once you have completed your tasks, you will prepare your findings in a detailed report to the police department.

### Equipment

Computer with Internet access

Laboratory journal

Careerjournal

Ward's Sherlock Bones: Identification of Skeletal Remains Kit (2) Protractor

Metric ruler

Calipers (large and small)

Skeletal remains- skull, pelvis, humerus and femur or tibia

Laminated instruction cards and photographs (one set per station plus extra copies of the nasal index photographs) Calculator

Project 1. 2. 3: Student Data Sheet

Anatomy in Clay® Maniken®

Skeletal system graphic organizer

### Procedure

1. Visit the website Visible Proofs: Forensic Views of the Body presented by the National Library of Medicine at <http://www.nlm.nih.gov/visibleproofs/education/anthropological/index.html>.

<https://assignbuster.com/bone-detectives/>

2. In the section “ Learning from Bones,” complete the visual comparison activities to determine the sex and the ethnic origin of the skulls. Take notes on the bone landmarks you used in your analysis in your laboratory journal.

3. Notice that forensic anthropologists use a three-race model to categorize skeletal traits. While there are obvious drawbacks to this model, race determination is considered a vital part of the overall identification process. Notice that in the National Library of Medicine site, ethnic origins are described by the scientific terms Caucasoid, Mongoloid and Negroid. In this activity, these terms will be used interchangeably with White, Asian and Black.

4. To learn more about the field of forensic anthropology and the duties of a forensic anthropologist, read the two interviews found at the bottom of the page (Barbian and Sledzick). Use the ideas presented in these two discussions to come up with your own definition of forensic anthropology. Write this definition in your career journal. You will further explore this career area in the next lesson.

5. Now that you have read about the role of a forensic anthropologist in analyzing skeletal remains, work with a team to analyze the bones from one of the unearthed skeletons. You will analyze features of bone to determine as much as you can about each person’s gender, ethnic origin, age and height. One team will be assigned Skeleton A and one team will be assigned Skeleton B. Make sure that you are only working on the bones that belong to your assigned skeleton.

6. Obtain a Student Data Sheet from yourteacher. Write “ Skeleton A” or “ Skeleton B” on the top of your data sheet in the box provided.

<https://assignbuster.com/bone-detectives/>

7. Divide your team into four groups. Each group will begin at one of the four bone stations.

8. Bring your Maniken® with you to each station.

9. Rotate through the four bone identification stations for your skeleton and complete your analysis. At each station, you will be asked to complete both visual comparison exercises as well as metric measurements. Determine which bone you are analyzing and locate the appropriate data tables on your Student Data Sheet. NOTE: As you are only looking at four bones, you will not use all of the data tables displayed on the Student Data Sheet.

10. At each bone station, complete the following items. Along the way you will encounter many terms for bones or for markings on bones that you may not have heard before. Use the laminated photographs and your knowledge of directional terms to help decipher these clues and complete each step of the analysis. Use the laminated Ward's instruction card, laminated photographs, and tools at each station to complete the observations or measurements listed for that bone, and determine as much as you can about the person's gender, race and age. NOTE: Not all bones will be used for all three categories.

Work with your group to come to consensus on each trait/measurement. Record your findings on the Student Data Sheet. NOTE: Forensic anthropologists use a scaled system when assessing features from bones. For example, when they look at the shape of the eye sockets to help determine gender, they use a 5 point assessment scale, with each gender at an end of the scale. The shape may fall somewhere in the middle. Therefore,

looking at multiple features is necessary to make an informed assessment. Think about this process as you evaluate the bones.

For the following structures, mark the bone or bone landmark on your Maniken® with a pencil. Use the skeletal remains and the laminated photographs to find and identify each structure. Continue the key you began in Activity 1. 2. 1 and 1. 2. 2 to link features on your Maniken® to your skeletal system graphic organizer. NOTE: Some of these structures may already be labeled.

- |     |           |          |           |
|-----|-----------|----------|-----------|
| 1.  |           | Ischium  |           |
| 2.  |           | Ilium    |           |
| 3.  |           | Coccyx   |           |
| 4.  |           | Sacrum   |           |
| 5.  |           | Pubis    |           |
| 6.  | Pubic     |          | Symphysis |
| 7.  | Eye       |          | Orbit     |
| 8.  | Nasal     |          | Cavity    |
| 9.  | Zygomatic |          | Bone      |
| 10. |           | Mandible |           |
| 11. |           | Maxilla  |           |
| 12. |           | Femur    |           |
| 13. |           | Humerus  |           |
| 14. | Tibia     |          |           |

11. If you are waiting to view your next bone, take the measurements of the enlarged skull photos in order to determine the nasal index for the three ethnic groups. The procedure is outlined in the instruction card found at the

<https://assignbuster.com/bone-detectives/>

skull and additional copies of this protocol should be available from your teacher. This information will be a useful comparison when determining ancestry from the skull.

12. When your group has made preliminary findings regarding the gender and ethnicity of the remains, use the equations listed in the data tables to estimate height.

13. To determine the probable height range of the individual, refer to the height tables and record the minimum and maximum value of the calculated height ranges (looking at both bones). Convert the minimum and maximum value to feet and inches and estimate the height range of this individual.

14. Meet with your entire team to discuss results and come to consensus on the characteristics of your assigned skeleton. You may need to go back to specific bones if groups disagree. Work together to form a conclusion about gender, height, ethnicity and age. 15. With your group, prepare a formal case report of your findings. This typed report should be written using terminology that you understand and should include the following headings:  
Introduction: Provide a brief case description.

Summary of Findings: Provide evidence and support for your findings for each trait - sex, ethnic origin, age and height. NOTE: You do not need to list every measurement/observation as evidence. Think about your analysis as a whole and describe how combined data led you to a conclusion. Discuss any inconsistencies in the data and address the limitations of these methods in determining identity.

Further Analysis: Read the FBI file on facialreconstructionat <http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/jan2001/phillips.htm/>.

Discuss how this technique could be used in this case. Research and report on at least two other tests/types of analysis that can be completed using the bone samples. What can we learn from these tests? How can this information be used to identify the missing?

Conclusion: Sum up the case findings and your recommendations for the next steps of the investigation in 1-2 paragraphs.

### **Conclusion**

1. How did your findings compare to the rest of your team and to the actual data provided by your teacher? What could account for any variation?
2. Why do you think the pelvis is often the first bone forensic anthropologists look to in determining sex from skeletal remains?
3. The developmental occurrences you used to determine age stopped at age 25. What are other clues a forensic anthropologist may be able to use to determine age if the bones belong to a person over age 25?
4. What is the difference between qualitative and quantitative evidence? Explain how both types of measurements played a role in this activity.
5. To analyze the long bones, the femur and the humerus, you looked at bone markings such as condyles, tuberosities and trochanters. Look back at the photographs and at the bone markings on your Maniken®. How would you describe these markings in your own words? Which features do you think separate each class of markings from the others?



6. In this activity, you were able to analyze skeletal remains in order to determine four particular traits of an individual. In a real life situation, scientists could provide a more detailed description of the individual based on additional information that can be acquired from the bones of this person. Describe at least two other pieces of information you could possibly learn from bone. Make sure to provide a specific example for each piece of information.