

Forensic Identification

Watch it online <http://www.kqed.org/quest/television/view/68>

Story length 3:30 minutes

QUEST SUBJECTS

Life
Science

Biology
Health
Environment

Earth
Science

Geology
Weather
Astronomy

Physical
Science

Physics
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 7

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. (e)

Earth and Life History (Earth Science)

4. Evidence from rocks allows us to understand the evolution of life on Earth. (d)

Structure and Function in Living Systems

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. (c)

Grade 8

Chemistry of Living Systems (Life Sciences)

6. Principles of chemistry underlie the functioning of biological systems. (a, b, c)

PROGRAM NOTES

Call them detectives of a different sort. Investigate the world of forensic anthropology with University of California, Santa Cruz doctoral candidate and “bone detective” Chelsey Juarez. She has developed a novel technique to help identify the remains of migrants who die crossing the border between the United States and Mexico.



In this segment you'll find out...

- ⦿ why Chelsey Juarez developed the new technique to identify the remains of migrant workers.
- ⦿ how teeth are prepared and examined to provide information about where we come from.
- ⦿ the important role forensic anthropologists play in forensic science.

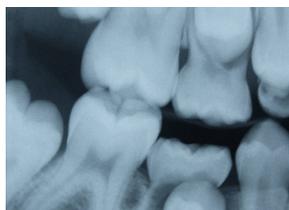
TOPIC BACKGROUND

Forensic science is the application of scientific methods and processes to the law. A forensic scientist usually works in a lab analyzing different types of evidence and writing reports, and also testifies in court as an expert witness. Sometimes forensic scientists go to crime scenes to help reconstruct the crime and collect or preserve evidence. Forensic scientists work in a variety of settings, such as local, state and federal governments; forensic labs; police departments; universities or as independent consultants.

The field of forensic science has many branches, including forensic entomology, forensic toxicology, forensic pathology and forensic anthropology. A forensic anthropologist examines skeletal remains. It's a unique profession that falls under both forensic science and physical (biological) anthropology. “Bone detectives,” as they are commonly known, are educated in physical anthropology (particularly skeletal biology), archaeology, anatomy, osteology and the allied sciences. They are usually university or college professors who consult with the criminal justice system and apply their knowledge to public discussion and debate.

One subfield of forensic anthropology is osteology, or the study of bones. By examining bones and bone fragments, forensic anthropologists are able to determine identity, diet, cause of death, gender, approximate age and likely racial affiliation of a person.

Another subfield is forensic odontology, which examines dental evidence to determine either the identity of a crime victim or the offender. The teeth are some of the most durable parts of the human body. An adult human has 32 teeth: 2 incisors, 1 canine, 2 premolars and 2 or 3 molars (depending on the presence of wisdom teeth) in each quadrant (each side of the upper and lower jaws). Children have 20 teeth: 2 incisors, 1 canine and 2 molars in each quadrant. Forensic anthropologists use several methods to identify individuals from different locations. One uses isotopes (from the Greek for “same place”), which are any of the several different forms of an element that have the same atomic number (number of protons) but different atomic masses (number of neutrons).



Media Enhance Education

Video and audio can be powerful tools for meaningful learning. It all depends on you, the educator. The key to using media effectively is preparation. Make the most of learning opportunities by encouraging students to become active viewers and listeners. Pick and choose from the suggested questions and activities to offer an engaging media experience.

Questioning

Oftentimes, teachers and students become frustrated during a media segment when students can't find the answers to a long list of questions. Provide a limited number of questions or topics for students. This focuses their attention during a media segment, helps to keep them engaged and generally results in higher quality answers. QUEST Ed. has provided a number of options for focus questions ranging from fact based to opinions, as well as "big picture" ideas.

PRE-VIEWING

- Have you heard of the field of forensics?
- What do forensic scientists do?
- Can scientists use teeth to identify a person?
- What kinds of information can teeth tell scientists?

VIEWING FOCUS

NOTE: You may choose to watch the television segment twice with your students: once to elicit emotional responses and get an overview of the topic and again to focus on facts and draw out opinions.

- Record any facts you find interesting while you watch.
- What is a forensic anthropologist?
- What problem is Chelsey Juarez trying to address with her research? What is her goal?
- What is an isotope?
- Where is strontium located in the tooth?
- How does Juarez prepare tooth samples for testing?
- On what location does Juarez focus her research?

POST-VIEWING – Links to activities mentioned here can be found on the following page.

- **Review** students' answers to the Viewing Focus Questions.
- **Read** more about bone detectives in the "Career of the Month" section from NSTA's **The Science Teacher** February 2007.
- **Learn** and identify the bones of the body by studying a skeleton.
- **Submit** questions to geneticists and find answers to others' questions about forensics and DNA on The Tech Museum of Innovation's Web site. <http://www.thetech.org/exhibits/online/topics/42a.html>
- **Hear** more from Chelsey Juarez about the chemistry behind her identification technique at <http://www.kqed.org/quest/television/view/81>.

LESSON PLANS / ACTIVITIES



TechTopics: Genetics The Tech Museum of Innovation

<http://www.thetech.org/exhibits/online/topics/42a.html>

- Learn about the history of forensic science, fingerprinting and how the FBI collects and analyzes DNA. Explore how and when DNA evidence should be used in court.



Fingerprinting (GEMS) Lawrence Hall of Science

<http://www.lhs.berkeley.edu/gems/GEM180.html>

- Explore the similarities and variations in fingerprints. Students take their own fingerprints and solve a crime. Grades 4-8.

“Dem Bones: Forensic Resurrection of a Skeleton” Alease Bruce

Department of Health and Clinical Sciences, University of Massachusetts, Lowell, 2001

<http://ublib.buffalo.edu/libraries/projects/cases/bones/bones.html> (Case)

http://ublib.buffalo.edu/libraries/projects/cases/bones/bones_notes.html (Teaching Notes)

- Learn to identify bones, landmarks and anatomical features associated with sex, age, height and pathology.

Wanted: Butch and Sundance: Identifying the Skeletons NOVA Online

http://www.pbs.org/wgbh/nova/teachers/activities/2011_butch.html

- Students work in teams as “forensic anthropologists” to piece together data to determine which bones might have been the remains of three missing scientists.

Bones and the Badge: Bones in the Canyon Case WebQuest, Clarissa Labor

<http://projects.edtech.sandi.net/kearny/forensic/>

- Students analyze and collect data gathered from bones found at a crime scene.

ARTICLES / READING

“Career of the Month: Bone Detective”

http://www.nsta.org/main/news/stories/science_teacher.php?news_story_ID=53239

- **The Science Teacher** (NSTA) article (February 2007)

Bone Detective: The Story of Forensic Anthropologist Diane France (Women's Adventures in Science)

Joseph Henry Press, Washington, D.C., 2006

Diane France loves bones. Why? Because they talk to her. Every skeleton she meets whispers secrets about the life—and death—of its owner.

The Bone Lady: Life as a Forensic Anthropologist Mary H. Manhein

Penguin, New York, 2000

The first nonfiction account by a female forensic anthropologist, this book is a collection of short stories about forensic and bioarchaeology cases in Louisiana.

The Bone Detectives: How Forensic Anthropologists Solve Crimes and Uncover Mysteries of the Dead Donna M. Jackson and Charlie Fellenbaum

Little, Brown Young Readers, New York, 1996

A real-life murder case solved through the painstaking work of bone detectives serves as a springboard for examining the techniques employed by forensic anthropologists in fighting crime and unraveling archeological puzzles. Ages 9-12

Look for the



indicating resources from QUEST partner organizations

QUEST QUAD

FIELD NOTES



Go outside and ...

- Look for clues
 - Can you find human footprints or animal tracks in the dirt? To whom might they belong? Where do you think they were going? Can you guess if the individual was moving quickly or slowly?
- Identify plants
 - Create a chart listing all the characteristics you could use to identify a plant down the side with spaces to write plant names along the top.
 - Fill out the chart for three mystery plants and sketch them all.
 - Use your notes to identify your plant online or in an identification field guide.

FIELD TRIP



Visit ...

- A local university, police station or crime lab.
 - Observe some of the forensic techniques used by the scientists in their efforts to solve a crime.
- Visit a dentist in your area to learn more about teeth.

FIELD RESEARCH



Find out more about...

- Other careers in forensic science
 - Interview a forensic scientist who works at a local university, police station or crime lab and ask him or her to describe a typical day.
 - Research forensic careers on the Internet and find out more about the education and skills you need to pursue a career in forensics <http://www.forensiccareers.com/>.

FIELD TEST



Experiment with...

- Identifying the bones of a skeleton
 - Pay special attention to those parts of the skeleton forensic anthropologists use to identify the gender, age and sex of an individual, such as skull and pelvic bone.
- Fingerprint analysis
 - Use an ink pad and paper or clear tape to make fingerprints of people.
 - Compare the similarities and differences among the prints.
 - Construct your own mystery for friends to solve using the fingerprints.

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The Bay Institute
www.bay.org

California Academy of Sciences
www.calacademy.org

Chabot Space and Science Center
www.chabotspace.org

East Bay Regional Park District
www.ebparks.org

Exploratorium
www.exploratorium.edu

Girl Scouts of San Francisco Bay Area
www.girlscoutsbayarea.org

Golden Gate National Parks Conservancy
www.parksconservancy.org

Lawrence Berkeley National Laboratory
www.lbl.gov

Lawrence Hall of Science
www.lawrencehallofscience.org

Oakland Zoo
www.oaklandzoo.org

The Tech Museum of Innovation
www.techmuseum.org

UC Berkeley Natural History Museums
<http://bnhm.berkeley.edu/>

OTHER WAYS TO PARTICIPATE IN QUEST



LOG ON

www.kqed.org/quest



LISTEN

**KQED 88.5 FM San Francisco &
89.3 FM Sacramento**
Fridays at 6:30am and 8:30am



WATCH

KQED Channel 9
Tuesdays at 7:30pm

PHOTO CREDITS

Chelsey Juarez: Elizabeth Pepin

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