WRITTEN IN BONE
FORENSIC FILES OF THE 17TH-CENTURY CHESAPEAKE
EDUCATOR’S MANUAL
Smithsonian
National Museum of Natural History
SAVE OUR HISTORY.
Teach your students to read the stories written in bone.

All New Forensic Anthropology Lab

The Smithsonian’s National Museum of Natural History is proud to announce the opening of a new Forensic Anthropology Lab. The all new Forensic Lab offers hands-on activities connected with the Written in Bone exhibition.

In the Forensic Anthropology Lab, your students will use the tools of forensic anthropologists as well as their own problem-solving skills to investigate forensic cases using real bones. They will use real human bones to identify and describe the gender and status of people from the past and present and draw conclusions about their lives. They will also explore the use of objects, insects, and other natural and man-made artifacts in forensic science and will solve mysteries through investigation.

Get hands-on with science today. Visit www.mnh.si.edu/education/fieldtrip. Forensic programs require reservations for school groups and are for Grades 4-12.

The Smithsonian’s Written in Bone exhibition captured my imagination from the moment I first heard about it, when it was still in the planning stages. Forensic anthropologists decode the cryptic messages of skeletal remains from early America. They employ the latest technology to uncover details of everyday life, details inaccessible through traditional documentary sources. Their discoveries provide new insights on topics ranging from birth to death in the 17th-century Chesapeake. Sometimes it’s grisly, but it’s always authentic. What’s not to love? As an educator, I think the work of Doug Owsley and his team is an ideal way to reach today’s young people, with this seamless combination of science and history. It’s CSI meets colonial America, giving the past a new voice through modern technology. And as a historian, I am delighted that the National Museum of Natural History is presenting the remarkable evidence about the individual experience in colonial America through an exciting and accessible new exhibition for visitors of all ages to enjoy.

HISTORY has worked with the experts at the Smithsonian to create the on-site short films that accompany the manual. We also collaborated on this educator’s manual to enrich the learning experience for teachers and parents. Whether you teach in the classroom, after school, or at home, we hope you find it a useful place to start your exploration of a past that is truly “Written in Bone.”

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The content of this educator’s manual was adapted from the exhibition Written in Bone: Forensic Files of the 17th-Century Chesapeake on view at the Smithsonian’s National Museum of American History February 7, 2009 February 6, 2011.

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How do we uncover new evidence about the past? Is it possible to envision more clearly the contours of the human experience, stretching back hundreds of years? While many students may be familiar with the wide variety of sources anthropologists and historians use to retrace the past, this educator’s manual introduces a source few of us may have considered: the human skeleton. The Smithsonian’s National Museum of Natural History has launched an exciting new exhibition entitled Written in Bone: Forensic Files of the 17th-Century Chesapeake. Using the tools of forensic anthropology, this exhibition explores the way bones can be examined to reveal new insights into human life and habits in the 17th century.

**FORENSIC FILES OF THE 17TH-CENTURY CHESAPEAKE**

### INTRODUCTION

Based on research conducted by Doug Owsley and his team of forensic anthropologists at the Smithsonian’s National Museum of Natural History, this exhibition highlights what these experts have learned from analyzing several skeletons unearthed in the Chesapeake area dating back to the 17th century. Owsley and his team treat each new skeleton as a time capsule that can speak volumes for the peoples and communities that can no longer speak for themselves. This educator’s manual is intended as a companion to the Written in Bone exhibition. Educators are encouraged to use the activities and background information in this manual for additional classroom curriculum links before and after visiting the museum. For those unable to visit the exhibition in person, this manual can be used as an informative introduction to the field of forensic anthropology with a special focus on the history of the Chesapeake colonies.

An introductory section of this manual provides a framework for the key concepts and themes explored in the Written in Bone exhibition. Activities based upon grade level will allow teachers to connect these concepts with a variety of curriculum areas including geography, history, social studies, and science and technology. The exhibition and manual also introduce students to the many exciting applications of forensic anthropology and related fields, allowing students to consider the ways new research tools have relevance to their everyday lives and possible career choices.

### BONE BIOGRAPHIES

Written in Bone: Forensic Files of the 17th-Century Chesapeake focuses on the ways forensic anthropologists examine skeletons to learn about history. One skeleton can reveal the life story of a person — and many skeletons can help tell the story of a group of people. These tales can be recent or hundreds of years old. We can think of bones as skeleton keys, and these keys can help unlock stories from the past.

A scientist who uses the “keys” in human bones and teeth is a forensic anthropologist. The word forensic refers to the application of science to legal or criminal matters, but forensic anthropologists can investigate both modern and ancient skeletons and remains to solve mysteries. Every skeleton holds a unique human history. Even before birth, a skeleton is building a “bone biography.” The living tissue of bone records “life data” as a person grows, lives, and dies. Bones and teeth often withstand decay, so the data may survive long after death. Sometimes skeletal evidence is the best way to learn about a once-living person.

The guide below provides a framework for understanding what information students can learn by analyzing bone and compiling “bone biographies.” By learning more about how to examine skeletons, students will be introduced to an exciting new way of learning about the past, and will be able to explore the relevance of forensics in our contemporary world.

### ALL ABOUT BONES

- An adult human has 206 bones, but a child has more — about 300 bone “parts.”
- Bone is living tissue made up of cells within a matrix of protein (mostly collagen) and minerals (mainly calcium and phosphorus).
A TALE OF TWO COLONIES

The Written in Bone exhibition focuses on excavations at two key 17th-century settlements: Jamestown, Virginia and St. Mary’s City, Maryland. These remarkable excavations have produced a volume of artifacts dating back to the formation of these early colonies. In the decades after 1607 when the first European settlers arrived in Jamestown, shipload after shipload of colonists sought new lives in North America. Some of these settlers were explorers in search of riches and new land, others were common people seeking religious freedom, and others were indentured servants thrust into the New World out of force and necessity. As settlers continued to arrive, they moved inland and set up forts along the coastal rivers of Virginia and Maryland.

While historians and anthropologists have parsed written sources for insights into life in the colonies, some of the most detailed and intimate sources have not been analyzed until recently. Transformations in technology and a new understanding of bone evidence have allowed forensic anthropologists to unearth, literally, a wealth of new information about daily life in the colonies. These examinations have shed light on interactions between European settlers and their new environment, including their interactions with Native populations of the Chesapeake, and have contributed new information about the lives of Africans in the Chesapeake after their arrival in 1619. The background context below will help provide a context for exploring the themes and findings covered in the Written in Bone exhibition.

JAMESTOWN

Four centuries ago, a band of just over 100 English adventurers arrived on the shores of the James River of the Chesapeake Bay and established a settlement known as Jamestown. The charter for the colony had been granted by King James I of England, who hoped the settlers would establish profitable trade relationships and find a route to the Pacific Ocean. When they arrived in May of 1607, the settlers built a fort. From 1607 until 1698, Jamestown (also referred to as James Fort or James City) served as the capital of the Virginia Colony.

The first several years of settlement in Virginia were extremely difficult – as many as one third of the English died within a year of arrival. Led by Captain John Smith, the settlers faced harsh conditions, food shortages, and difficult negotiations with the Powhatan Indians. Relations between the English and the Powhatan tribe were mixed; at times they traded peacefully, and at other times their interactions turned violent. In 1609, relations reached a breaking point when Chief Powhatan tried to undermine the power of the colonists by ending their trade relationship just as new shiploads of settlers arrived in Virginia. This period, known as the “Starving Time,” led to extreme hunger and high rates of mortality among the settlers.

Despite the enormous difficulties they faced, the colonists managed to prevail and Jamestown survived. Improved relations with the Powhatan Indians emerged with the union of English leader John Rolfe and Pocahontas, the daughter of Chief Powhatan. Rolfe also introduced tobacco to Jamestown, providing a lucrative new crop. In 1619, the first Africans arrived at Jamestown, and within a few decades a system of enforced labor based on race was established.

As the Jamestown settlement grew, the old fort was abandoned and a larger town developed. In the past decade, archaeological excavations at this site have unearthed much of the 17th-century town, with hundreds of artifacts that help reveal what everyday life was like in Jamestown. This manual focuses on the insights anthropologists and historians have gained from analyzing one category of evidence uncovered at the site: bones.

ST. MARY’S CITY

In 1634, another English colony was founded in the northern Chesapeake. Though there were many similarities between the Maryland colony and Jamestown, there were some notable differences. George Calvert was the Secretary of State for King James I during a period of intense conflict between Protestant England and Catholic Spain. Calvert, a Catholic, was held in high esteem by the King, and his family was granted land in the Chesapeake; his son, Cecil Calvert, inherited the charter to the colony. While the majority of investors in the colony were Catholic, most of the workers tasked with building the colony were Protestant. In order to avoid conflict, the settlement – named St. Mary’s City – was founded as non-denominational in a spirit of religious tolerance.

Though there were challenges in Maryland as in Virginia, St. Mary’s City slowly prospered. Tobacco became a key crop in the Chesapeake during the second half of the 17th century and new settlers arriving in Maryland advanced socially and economically. Indentured servants and slaves were used as inexpensive laborers to cultivate crops and construct buildings. Interactions with Native American groups, much like in Jamestown, veered between peaceful coexistence and spouts of violence.

In 1688, King James II was overthrown by a revolution in England. The Calverts’ charter had ended – Maryland became a royal colony and the capital was moved to Annapolis in 1695. St. Mary’s City was abandoned and turned into farmland. The rural terrain on which the colony was established helped preserve the remains of the settlement under a thin layer of plowed soil. This area remained sparsely populated for generations, providing good conditions for the preservation of artifacts buried underground. A series of excavations has yielded fascinating new insights into everyday life in the colony. Among the most important findings at Historic St. Mary’s City are the graves and the skeletons within them, which speak for the colonists who can no longer speak for themselves.

Photo: Chip Clark, Smithsonian Institution

A reconstructed brazier situated in one of Jamestown’s first settlers’ houses. The brazier contained the ashes of braziers to be added to the coal of the stove. The brazier and its contents were excavated by archaeologists. Photo Don Klobas, Smithsonian Institution
**ACTIVITIES**

**GRADES 5-6**

The activities in this manual are intended to be creative suggestions for teachers looking for ways to implement the concepts and content explored in the *Written in Bone* exhibition in their classrooms. Some of these activities can be pursued before visiting the exhibition, and others will work most effectively after students have visited the exhibit or explored the themes it covers through other classroom course units. For teachers and students unable to visit the exhibition in person, these activities can be adapted to fit relevant course units. Teachers are also encouraged to visit the Smithsonian’s National Museum of Natural History online to view companion materials associated with the exhibition: www.mnh.si.edu/education/exhibitions/writtenbone

**VOCABULARY**

Using the dictionary at www.merriamwebster.com, an Internet resource such as www.History.com, or an encyclopedia, students should define or explain the significance of the following terms:

- anthropology
- colony
- excavate
- osteology
- artifact
- DNA
- forensic
- preservation

**COMPREHENSION QUESTIONS**

The questions below can be presented to students for the purpose of classroom discussion, for a short written response, or as critical thinking questions to consider before or after viewing the exhibition.

1. The *Written in Bone* exhibition focuses on life in the 17th century. What do you know about this time period? What is the source of your information?
2. What are some of the things we can learn from studying skeletons from the past? Where else can we get this information?
3. Why do you think it is important for anthropologists to be very careful when they are doing excavations?
4. What is DNA, and what can we learn from studying it?
5. The *Written in Bone* exhibition reveals many new findings about life in the 17th-century Chesapeake. Why do you think it is important to study this time period?

**ACTIVITIES**

1. **Bone Biography:** A “bone biography” tells the story of a person from the past through an analysis of their bones and skeletal structure. It includes information about who they were, how they lived, and possibly reveals how they died. Ask students to create their own bone biographies of one of the individuals explored in the exhibition. Details to include, if possible, are: identity (Where was he/she from?), age, gender, cause of death, and occupation. If students don’t have all of the details they need, they can make hypotheses based on the evidence found from the bones or based on what they have learned through research.

2. **Artifacts Uncovered:** By analyzing artifacts from the 17th century, we can learn an enormous amount about how people lived and interacted during that time period. Ask students to create a list of artifacts unearthed in Jamestown and St. Mary’s City and write 1-2 sentences about what these artifacts can tell us about life in the 17th-century Chesapeake.

3. **A Day in the Life of the Chesapeake:** The *Written in Bone* exhibition sheds light on numerous individuals who lived during the 17th century. Ask students to imagine they were alive during this time period and lived in Jamestown or St. Mary’s City. Have them write short diary or journal entries about what daily life was like from the perspective of one individual. Students should be sure to provide details about their identity in their writing.

4. **Cracking the Case:** In order to determine information about an individual by analyzing their graves and bones, forensic anthropologists must take into account many different types of clues to help them unlock the story of who the person was and how they may have died.

Ask students to choose one or more of the following scenarios and write a short paper about what this information could reveal about the person from the past.

- a) Multiple skeletons are discovered in a single grave. What might this reveal about the circumstances under which these individuals died?
- b) Forensic analysis shows that an individual had advanced stages of tooth decay. Given this information, what might you conclude about the individual’s background and social status?
- c) Analysis of a skeleton reveals notches or grooves in the front teeth. What might this clue reveal about the identity of the individual?

After providing answers to these clues, ask students to brainstorm and discuss additional clues that may reveal insights into individual and group life in the 17th-century Chesapeake.
The activities in this manual are intended to be creative suggestions for teachers looking for ways to implement the concepts and content explored in the Written in Bone exhibition in their classrooms. Some of these activities can be pursued before visiting the exhibition, and others will work most effectively after students have visited the exhibit or explored the themes it covers through other classroom units. For teachers and students unable to visit the exhibition in person, these activities can be adapted to fit relevant course units. Teachers are also encouraged to visit the Smithsonian’s National Museum of Natural History online to view companion materials associated with the exhibition: www.mnh.si.edu/education/exhibitions/writteninbone

ACTIVITIES GRADES 7-8

The activities in this manual are intended to be creative suggestions for teachers looking for ways to implement the concepts and content explored in the Written in Bone exhibition in their classrooms. Some of these activities can be pursued before visiting the exhibition, and others will work most effectively after students have visited the exhibit or explored the themes it covers through other classroom units. For teachers and students unable to visit the exhibition in person, these activities can be adapted to fit relevant course units. Teachers are also encouraged to visit the Smithsonian’s National Museum of Natural History online to view companion materials associated with the exhibition: www.mnh.si.edu/education/exhibitions/writteninbone

VOCABULARY

Using the dictionary at www.merriamwebster.com, an Internet resource such as www.history.com, or an encyclopedic, students should define or explain the significance of the following terms:

ancestry  cranium  forensic  preservation

carbon  isotope  DNA  indented  servant  radiocarbon
colony  excavate  osteology  radiograph

COMPREHENSION QUESTIONS

The questions below can be presented to students for the purpose of classroom discussion, for a short written response, or as critical thinking questions to consider before or after viewing the exhibition.

1. What can forensic anthropologists learn by analyzing bones that we cannot learn from other kinds of historical sources?

2. Many of the 17th-century graves unearthed in the Chesapeake reveal clues into how and why someone died. If a grave or coffin was relatively small and very old, what might that reveal about the circumstances under which they had died?

3. Forensic anthropologists closely examine the DNA evidence from bones and other artifacts to learn more about how people lived in the 17th century. What are the various methods and tools forensic anthropologists use to examine and collect information from bones?

4. What does this exhibition reveal about the lives of Africans in the 17th-century Chesapeake? What are some of the ways forensic anthropologists determine the ancestry of the people whose bones they discover?

5. Life in the 17th-century Chesapeake was extremely difficult and mortality rates were very high. What are some of the insights we can draw about the challenges they faced from examining their bones?

6. How would a forensic anthropologist determine whether a skeleton was buried 400 years ago or four years ago?

ACTIVITIES

1. Bone Biography: A “bone biography” tells the story of a person from the past by analyzing their bones and burial. It includes information about who they were, how they lived, and possibly reveals how they died. Ask students to create their own bone biographies of one or more of the scenarios below and write a short paper about what this information reveals about the person from the past.

a) A skeleton shows signs of a severe bone fracture, and forensic anthropologists determine the individual was about 18 years old at the age of death. What might these clues reveal about the circumstances under which this individual died?

b) Forensic scientists determine that an early form of surgery had been performed on an individual in the 17th century. What are some of the clues that would lead them to draw these conclusions?

c) Analysis of a skeleton reveals notches or grooves in the front teeth. What might this clue reveal about the identity of the individual?

An additional glossary of terms and an activity guide can be found online at www.mnh.si.edu/education/exhibitions/writteninbone. These glossaries can be used as a field guide for students while visiting the Written in Bone exhibition or from their online research. They can be included in field trips, classroom discussion, for a short written response, or as critical thinking questions to consider before or after viewing the exhibition.
The activities in this manual are intended to be creative suggestions for teachers looking for ways to implement the concepts and content explored in the Written in Bone exhibition in their classrooms. Some of these activities can be pursued before visiting the exhibition, and others will work most effectively after students have visited the exhibit or explored the themes it covers through other classroom course units. For teachers and students unable to visit the exhibition in person, these activities can be adapted to fit relevant course units. Teachers are also encouraged to visit the Smithsonian’s National Museum of Natural History online to view companion materials associated with the exhibition: www.mnh.si.edu/education/exhibitions/writteninbone.

VOCABULARY

Using the dictionary at www.merriamwebster.com, an Internet resource such as www.History.com, or an encyclopedia, students should define or explain the significance of the following terms:

- antemortem
- indentured servant
- perimortem
- rickets
- beveled
- mitochondrial
- postmortem
- trephination
- carbon isotope
- osteons
- radiocarbon

COMPREHENSION QUESTIONS

The questions below can be presented to students for the purpose of classroom discussion, for a short written response, or as critical thinking questions to consider before or after viewing the exhibition.

1. What features of a person’s skeleton change over time? How can forensic anthropologists use that information to establish identity?
2. What differences would you expect to find between the burials and bones of two men of the same age, one the wealthy governor of Jamestown and the other an indentured servant?
3. Other than the bones themselves, what do forensic anthropologists look at for clues to wealth and social status?
4. Would you expect there to be significant differences between our own skeletons and those of people born 100 years in the future? What sort of differences?
5. How did archaeological forensic anthropologists decide that they had found the skeleton of Bartholomew Gosnold?
6. What can archaeological evidence tell us about Jamestown that we cannot learn from other sources?
7. What can we learn from a series of burials – a cemetery, for example – that we could not learn from an individual burial? What typical features would you expect to find in a cemetery, and what conditions or circumstances would lead people to diverge from those customs?
8. What evidence would you look for?
9. Why are teeth studied so closely? How can they suggest a person’s age? What evidence can teeth provide about diet, and what conclusions might be drawn from that evidence? How might the teeth of men and women of similar age differ in other ways, for example as a result of pipe smoking or cleaning?

ACTIVITIES

1. Laid To Rest: This exhibition explores a variety of different burial practices and scenarios from the 17th century. Based on the information covered in the exhibit, or additional research, ask students to make a list of features they would expect to find in a typical burial of the 17th century. Then, ask students to make a list of examples where these practices were not followed and to suggest what this divergence from normal practice might lead forensic anthropologists to conclude. Students should then write a short essay about burials during this time period and what they reveal about the early colonies.
2. Chesapeake Bone Biographies: Written in Bone tells the story of several prominent individuals in the 17th-century Chesapeake including Bartholomew Gosnold and Anne Wolseley Calvert. Ask students to pick one of these people, or another in the exhibition, and create a “bone biography” about them. These biographies can be in written format, in PowerPoint, or any other format of the student’s choosing and should include information about what forensic anthropologists have learned about each individual’s life and death from their research. If students have not visited the exhibition in person, they can pursue additional research online or at the library to create these biographies.
3. Africans in the New World: The first Africans arrived in the Chesapeake in 1619. Although evidence in the written record about Africans during the first few decades of settlement is not extensive, forensic anthropologists have been able to learn more about African lives during this time period by analyzing the bones and graves of those of African descent. Ask students to imagine that they were a forensic anthropologist investigating Africans in the early Chesapeake. Then, ask students to make a list of ten artifacts and/or characteristics found in the bones and teeth of skeletons from this period that provide clues into the lives of Africans. These lists can be presented in PowerPoint format, in bullet points, or as an official report.

4. Cracking the Case: In order to determine information about an individual by analyzing their bones and bones, forensic anthropologists must take into account many different types of clues to help them unlock the story of who the person was and how they may have died. Ask students to choose one or more of the scenarios below and write a short paper about what this information could reveal about the person from the past.

a) Forensic analysis of a baby’s skeleton reveals that the child died of rickets. What are some clues that would indicate that the child had this disease, and what are some of the causes of this disease in the 17th century?

b) The skeletons of animals such as snakes and rats are discovered among the remains in the trash pits of a 17th-century Chesapeake colony. What would these findings suggest about life for the colonists during this time period?

c) Sea shells are discovered inside a simple coffin from the 17th century. What might forensic anthropologists conclude from this finding?

d) Forensic anthropologists conclude that a 17th-century child died of lead poisoning by analyzing his or her skeleton. What would be some of the telltale clues that this was the cause of death?

e) A lead coffin dating from the 17th-century Chesapeake is discovered with rosemary sprigs inside. What might these features suggest about the person who was buried inside?

f) The skull of a skeleton from the Jamestown settlement shows signs of trephination. What does this mean, and what might it suggest about the circumstances of death? After providing answers to these clues, ask students to brainstorm and discuss additional clues that may reveal insights into individual and group life in the 17th-century Chesapeake.
The Written in Bone exhibition highlights a wide variety of sources from the early Chesapeake colonies. While the written records these settlements left behind were not extensive, historians and anthropologists do use a significant number of letters, diaries, and other writings as they study this time period. The vast majority of these sources are from the perspective of the English settlers; there are very few sources recorded by Native Americans and Africans in the early colonies. These writings provide students with additional insights into the encounters between people in the New World.

**PRIMARv SOURCES (GRADES 7-12)**

The Smithsonian’s National Museum of Natural History website on the Written in Bone exhibition: www.mnh.si.edu/education/exhibitions/writteninbone

**HISTORY’s special interactive sites on Jamestown:**

www.history.com/classroom/jamestown

Virtual Jamestown: www.virtualjamestown.org

APVA Jamestown Rediscovery: www.apva.org/jr.html

The interactive site of Historic St. Mary’s City: www.stmaryscity.org

Weroowacomoco Research Project on the Powhatan Confederacy: http://powhatan.wmu.edu

U.S. National Library of Medicine, National Institutes of Health: www.nlm.nih.gov

**ADDITIONAL RESOURCES**


Owlesly, Doug and Karin Bruvelheidah. Written in Bone: Bone Biographer’s Casebook (LeanTo Press, 2009).

Rountree, Helen C. Pocahontas, Powhatan, Opechancannah: Three Indian Lives Changed by Jamestown (University of Virginia, 2006).

**BOOKS FOR STUDENTS**

Bial, Raymond. The Powhatan (Marshall Cavendish, 2002).

Braun, Eric. The Story of Jamestown (Graphic History) (Capstone, 2006).


