

MUMMIERS

Secrets of the Pharaohs

EDUCATOR'S GUIDE

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Science Museum



MUMMIES: SECRETS OF THE PHARAOKS

EDUCATOR GUIDE

Inspired by *Mummies: Secrets of the Pharaohs*, this educational activity guide responds to several key questions.

What are Mummies?

Why did Ancient Egyptians preserve their bodies?

How does the mummification process work?

How does modern medicine compare with Ancient Egyptian medical practices?

What is forensic science?

How do forensic scientists use DNA?

To answer these key questions, the content is organized around two main themes: Mummies and Medicine.

In *Mummies*, the focus is on how and why the Ancient Egyptians adopted mummification rituals. Students will practice the mummification process by making apple mummies. As a group, the class will document observed changes that occur through the mummification of a chicken. To understand the science in its cultural content, the students will also create funeral masks.

The *Mummies* section includes:

- Introduction
- Connections to National Science Education Standards
- Vocabulary
- Fast Facts
- Background Information - Mummies and Natron
- Make an Apple Mummy
- Make a Chicken Mummy
- Make a Funeral Mask

In *Medicine*, the content considers both ancient and modern. The juxtaposition of ancient Egyptian medical practice—as documented in the Ebers Papyrus—with modern high-tech diagnostic techniques provides a rich learning opportunity. Students will compare and contrast the medicinal uses of natural substances as used in Ancient Egypt and as used today. Students will extract and visualize their own DNA in an attempt to model how forensic scientists use modern techniques to solve mysteries.

The *Medicine* section includes:

- Introduction
- Connections to National Science Education Standards
- Vocabulary
- Fast Facts
- Background Information - Ancient Egyptian Medicine and Forensic Science
- Medical Diagnosis
- Extract DNA

All of the activities are designed for curricular use in grades 5 through 8. Most of the activities could easily be adapted for use at any grade level, although the connections to National Science Education Standards become less direct at other grade levels. Many of the activities are also ideal for family learning in home-school or informal learning contexts.

Finally, lists of web resources and print publications suggest opportunities to continue student learning beyond the scope of this guide. Encourage students to deepen their understanding of mummification, DNA, and Ancient Egypt.



WHAT ARE MUMMIES?

WHY DID ANCIENT EGYPTIANS PRESERVE THEIR BODIES? HOW DOES THE MUMMIFICATION PROCESS WORK?

In *Mummies: Secrets of the Pharaohs*, we discover how and why the Ancient Egyptians adopted mummification rituals. Use the following information and activities to deepen that understanding. Students can individually practice the mummification process by making apple mummies. As a group, have your class document observed changes that occur through the mummification of a chicken. To understand the science in its cultural context, students can also create funeral masks. All of these activities have been designed to respond to the National Science Education Standards.



LEARNING OUTCOME:

Students will understand how and why ancient Egyptians preserved human bodies after death.

CONNECTIONS TO NATIONAL SCIENCE EDUCATION STANDARDS

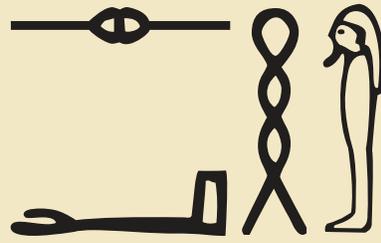
The activities support the National Science Education Standards. In particular, the activities meet the following objectives.

- **CONTENT STANDARD A: SCIENCE AS INQUIRY**
Activities meet this standard when students make accurate measurements, gather, store, retrieve, and organize data and when students understand that mathematics is essential to asking and answering questions about the natural world.
- **CONTENT STANDARD B: PHYSICAL SCIENCE**
Activities meet this standard in part when students see that common materials, such as water, can be changed from one state to another by heating or cooling and that objects have many observable properties, including size, weight, and shape.
- **CONTENT STANDARD C: LIFE SCIENCE**
Activities meet this standard in part when students learn that organs and tissues are part of organized structures and systems.
- **CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVE**
Activities meet this standard in part when students see that science and technology have advanced through contributions of many different people, in different cultures, at different times in history.
- **CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE**
Activities meet this standard in part when students realize that science has been practiced by different individuals in different cultures.





FAST FACTS



= "MUMMIES"
IN HIEROGLYPHS

VOCABULARY

BA - the Ancient Egyptian concept of the soul.

CANOPIK JARS - containers for storing the internal organs of a corpse. The decorative jars were made from various materials, including alabaster, limestone, pottery, wood, and bronze.

CARTONNAGE - a substance used to make Ancient Egyptian funeral masks. Similar to papier-mâché, it was made of linen or papyrus covered with plaster.

DESICCANT - a substance that absorbs moisture.

EMBALMING - the art and science of preserving human remains to forestall decomposition.

KA - the Ancient Egyptian concept of the human life force.

MINERAL - any of a class of substances occurring in nature, usually comprising inorganic substances of definite chemical composition and usually of definite crystal structure. In general, anything that is neither animal nor vegetable.

MUMMIFICATION - a process of embalming and drying a dead body and wrapping it as a mummy.

NATRON - a white/colorless salt found in the Earth in various locations around the world, including Egypt. It was used in Ancient Egyptian mummification.

NILE RIVER - the major, North-flowing river in Africa, generally regarded as the longest river in the world.

PHARAOH - political and religious leader of the Ancient Egyptian people. He owned the land, collected taxes, and defended Egypt from rivals. He represented the gods on Earth, performed religious rituals, and built temples.

PLASTINATION - a modern process of mummification in which the body's liquids are removed and replaced with plastic.

The English word "mummy" comes from the Arabic word *mūmiyyah*, which means "bitumen." Asphalt and tar are two common examples of bitumen. Unwrapped ancient mummies appear to have blackened skin, which resembles bitumen.

The Ancient Egyptians were not the only civilization that practiced mummification. The Aztecs and Incas in South America and the Tibetans and Japanese in Asia also left evidence of ancient mummification rituals.

The oldest known mummy dates back to 3300 BC. That mummy, *Ginger*, is in the British Museum in London.

An adult mummy required at least one hundred yards of linen, cut into many thin strips for wrapping.

Tucked among its linen strips, the mummy also carried "lucky charms" with it to the afterlife. These amulets were small ornaments that symbolized life, strength, and rebirth.

Ancient Egyptians commonly mummified animals, too, especially baboons, cats, birds, and crocodiles – all of which had special religious significance.





WHAT IS A MUMMY?

A mummy is a corpse whose skin and dried flesh have been preserved by either intentional or accidental exposure to chemicals, extreme cold, very low humidity, or airlessness. Ancient Egyptians used chemicals – natural salts – to dry their corpses. Basically, when all moisture is removed from a corpse, it becomes a mummy. The Egyptians used Natron – a naturally occurring desiccant. A desiccant is a substance that has a high affinity for water and is used as a drying agent.

The earliest known “mummy” dates back to approximately 3300 BC. This mummy is at the British Museum in London, England and has been given the nickname of “Ginger” because of its red hair. “Ginger” was found buried beneath the hot, dry desert sand which preserved the body.

Although mummification existed in other cultures, eternal life was the main focus of Ancient Egyptian religion. In order to prepare for eternal life, the body needed to be preserved so that the person's soul and essence – called “ba” and “ka” by Egyptians – would always have a place to reside after death. At first, the Egyptians tried to preserve the entire body. Over time, though, they realized that they needed to remove the internal organs. They crafted special canopic jars to hold the organs. Then, embalmers used natural salts to remove all moisture from the body so that it is difficult for bacteria to thrive inside it and cause decay. Once all moisture was removed and the body fully dried, the mummies were anointed with oils and fragrant spices to prepare them for their journey to the afterlife.

Since mummification was a process associated with religious belief in eternal life, the embalmers in Ancient Egypt were actually specially-trained priests. They knew how to work with salts and which prayers and rites were associated with each step in the process.

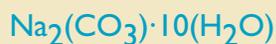
After the mummification process was complete, the mummy would be placed in a coffin and its head covered with a funeral mask that was specially designed to resemble the living face of the mummy. The Ancient Egyptians believed that the person's soul and essence – their “ba” and “ka” – would use the funeral mask to recognize its body during reunion in the afterlife.

Funeral masks were sometimes made of solid gold, if the person was a pharaoh or other person of great importance. More often, the mask would be made of wood or cartonnage (similar to papier-mâché) and then gilded or painted with gold.

WHAT IS NATRON?

Natron is a white/colorless salt found in the Earth in various locations around the world, including Egypt. The Egyptians called it Natron because they found vast supplies of it in the Natron Valley's salt lakes. These lakes were linked to the Nile River via underground channels, but they were dry most of the year.

Natron is a hydrated sodium carbonate mineral with the formula $\text{Na}_2(\text{CO}_3) \cdot 10(\text{H}_2\text{O})$. Notice the elements in the formula: Hydrogen (H), Oxygen (O), Sodium (Na), and Carbon (C).



Molecular Weight = 286.14 gm

Sodium	16.07 % Na	21.66 % Na_2O
Hydrogen	7.05 % H	62.96 % H_2O
Carbon	4.20 % C	15.38 % CO_2
Oxygen	72.69 % O	
TOTAL OXIDE =	100.00 %	100.00 %

When Natron comes in contact with moist materials, it acts as a drying agent, drawing the moisture out of the other material and into its own molecules.

As a mineral, Natron had many other uses in Ancient Egypt besides for mummification. Artists mixed Natron with other minerals and oils to make the color known as "Egyptian Blue" that appears in so many recovered artifacts. Natron was also used to make glass and ceramics and as a soldering agent for binding precious metals (especially gold) together. Mixed with oil, Natron became a kind of soap. Mixed into a paste, Natron was used as a toothpaste and mouthwash. When mixed with salt, Natron could be used to preserve fish and meat for future meals. In many ways, Natron was a vital ingredient of civilization in Ancient Egypt.

Natron is still mined and used today. One surprising use is in the preparation of Bavarian Pretzels! Dough is dipped in a Natron solution before baking to give the pretzels their distinctive flavor and brown color.

MODERN MUMMIES

Have you heard of plastination?

Gunther von Hagens invented the process of plastination while working at the anatomical institute of the University of Heidelberg in 1978. Like in other mummification processes, the water and moisture is removed from the body. In plastination, the fluids are replaced with plastics, taking the space of fluids so that the body retains much of its original form.

The result is a mummy that can be touched, does not smell or decay, and even can continue to resemble the living being – both in appearance and at the cellular level.

LET'S MAKE AN APPLE MUMMY!

YOU'LL NEED FOR EACH STUDENT OR GROUP:

Small apple	Table salt
Two plastic cups (about 10 ounce size)	One-cup measuring cup
Baking soda	Knife to cut the apples
Spoon	

DIRECTIONS:

1. Cut the apple in half. Then, cut each half in half again so that you have four quarters. Put one quarter in each of your two plastic cups. (You won't need the other two quarters, so you can eat them.)
2. Fill the measuring cup to the one-third cup level with baking soda. Then, use the salt to continue filling the cup up to the two-thirds level. Use the spoon to gently mix the baking soda and salt together in the cup.
3. Pour the mixture into one of the two plastic cups, covering the apple quarter. Make sure the apple is completely buried.
4. The apple in the other cup is your control sample. Do nothing to it. Leave it exposed to air.
5. Place the two cups side-by-side somewhere dry and away from direct sunlight. (A shelf in a closet or cabinet works well.)
6. Wait seven days. Carefully uncover your buried apple by pouring the baking soda/salt mixture out. Compare the two apples. (Warning: do not eat either apple! Discard both after you finish comparing them.)



MAKE A CHICKEN MUMMY

FOR PHASE ONE, YOU'LL NEED:

- A small, fresh, whole chicken from the grocer or butcher. The smaller the chicken, the better. (Do not use a previously frozen chicken!)
- 12 gallon-sized plastic bags with interlocking closures. You may not use all 12 bags, but it's important to make sure you have enough identical bags to complete the process.
- 4 pounds of ordinary table salt
- 4 pounds of baking soda
- Rubber gloves for everyone who will handle the chicken.
- Paper towels.
- Access to a sink / tap water.
- A sharp knife.
- Measuring scale. (optional)

DIRECTIONS FOR PHASE ONE

1. Make sure that the chicken's cavity is empty. Remove the neck, liver, and gizzard, if the chicken has those in its cavity.
2. Rinse the chicken, inside and out, with cool tap water, until the water runs clear. Allow it to dry, or use paper towels to pat it dry.
3. Mix equal parts of the salt and baking soda together in a bowl or one of the plastic bags. Throughout the process you will be using a mixture of salt and baking soda. You can either mix small batches each week, or pre-mix all of it and store it for use.
4. Make a symmetrical pattern of 8 shallow cuts in the chicken's skin and flesh. The exact location of the cuts doesn't matter, but try to make the pattern symmetrical.
5. Place the chicken inside a plastic bag.
6. Fill the cavity of the chicken with the salt & baking soda mixture. Rub it into the shallow cuts. Fill the bag with the mixture so that the chicken is entirely covered.
7. Squeeze excess air from the plastic bag and then seal it tightly.

During the first week, you will need to change the bag and salt mixture every 2-3 days. Open the sealed bag, shaking the chicken free of its newly moistened salt. Place the chicken in a fresh bag and repeat the process of treating it with the salt & baking soda mixture.

By the end of the first week, the chicken should be sufficiently free of moisture that the process will begin to become a weekly task.

During weeks 2 through 5 of the drying process, you will need to change the bag and add fresh salt weekly.

By week 6, the chicken should be completely desiccated.

DOCUMENT THE LOSS OF MOISTURE!

Each time you handle the chicken, place it on a measuring scale and log its weight. For hygiene purposes, you can weigh the chicken each time it is placed in its clean new plastic bag. Observe and note the changes in its appearance while you are handling it and moving it to its new bag. Visit the education section at www.mummiesfilm.com for a printable log sheet.

FOR PHASE TWO, YOU'LL NEED:

- 1 small container of cinnamon.
- 1 small container of cloves.
- 12 ounces of olive oil (Any kind.)
- Cotton or linen strips. White or natural color is best, but any solid color is fine. Start with 2 yards and cut the fabric into 1-inch strips.
- Rubber gloves for everyone who will handle the mummy.
- Paper towels.
- Access to a sink / tap water.

DIRECTIONS FOR PHASE TWO

1. Remove the desiccated chicken from the bag. Use wet paper towels to wipe it clean. Allow it to air-dry, or use paper towels to remove all surface moisture.
2. Pour a small amount of olive oil inside the cavity and allow it to run along the inside walls. You may need to reach inside to make sure all surfaces are coated. Repeat this process on the outside, coating the chicken entirely.
3. Sprinkle the cinnamon and cloves liberally, inside and out.
4. Wrap the cloth strips around the chicken several times, until the oil and spices are no longer visible. The outside layer of the cloth wrapping should be clean and dry.

Your mummified chicken is now ready for burial. The Ancient Egyptians buried their mummies in elaborate coffins called sarcophagi. Design an ornate box for the chicken, perhaps painted gold and adorned with gemstones.





MAKE A FUNERAL MASK

YOU'LL NEED:

Rigid Wrap Plaster Wrap (available in arts and crafts supply stores)

Scissors

Bowls of water

Newspaper or tablecloth to protect work surface

Vaseline Petroleum Jelly (or similar product)

Tempera paints and brushes

Large flat sheet of cardboard, cut to the shape of the pharaoh's headpiece

Glue to attach the face mold to the cardboard

DIRECTIONS:

1. Cut thin strips of the Rigid Wrap, various lengths ranging from 1 inch to 4 inches.
2. Cover a table or work surface with newspaper or tablecloth.
3. Identify a volunteer who will have his/her face cast to make the mask. (Some people have skin allergies to petroleum-based products. Be sure that the volunteer is not allergic to Vaseline.)
4. Make sure the volunteer is wearing a shirt that can safely get wet with plaster. (There shouldn't be much drippage, but it's possible, so be prepared.)
5. Make sure the volunteer's hair is entirely away from his/her face.
6. Apply a layer of Vaseline to the entire face, except for eyes and nostrils, stopping at the jawline. Do cover the eyebrows.
7. Begin wetting the strips of Rigid Wrap and applying them to the volunteer's face. Begin at the forehead with longer strips and work your way down and in so that the nose and lips are last. Be sure to overlap the strips so that they will harden into a solid cast. Be sure to avoid the eyes and nostrils.
8. The Rigid Wrap will begin to dry quickly. As soon as it is partially dry, remove the cast carefully and place in on the table or work surface to continue drying overnight.
9. Use soap and water to wash the volunteer's face.
10. When the cast is completely hardened, glue it onto a piece of heavy cardboard, which has been cut to the shape of the pharaoh's headpiece. Visit the education area at www.mummiesfilm.com for a template of possible headpiece shapes.
11. Paint the cardboard and face mold to resemble the funeral masks of the Ancient Egyptians. Use gold paint and perhaps some vivid blue paint that resembles "Egyptian Blue."



HOW DOES MODERN MEDICINE COMPARE WITH ANCIENT EGYPTIAN MEDICAL PRACTICES?

WHAT IS FORENSIC SCIENCE? HOW DO FORENSIC SCIENTISTS USE DNA?

In *Mummies: Secrets of the Pharaohs*, the connection between ancient and modern medicine is made. The juxtaposition of ancient Egyptian medical practice – as documented in the Ebers Papyrus – with modern high-tech diagnostic techniques provides a rich learning opportunity. Students will compare and contrast the medicinal uses of natural substances as used in Ancient Egypt and as used today. These activities are aligned with the National Science Education Standards.



LEARNING OUTCOME:

Students will understand Ancient Egyptian medical practices and how modern medicine – especially our understanding of DNA – enables us to diagnose and understand medical mysteries.

CONNECTIONS TO NATIONAL SCIENCE EDUCATION STANDARDS

The activities support the National Science Education Standards. In particular, the activities meet the following objectives.

• CONTENT STANDARD A: SCIENCE AS INQUIRY

Activities meet this standard when students make accurate measurements, gather, store, retrieve, and organize data and when students understand that mathematics is essential to asking and answering questions about the natural world.

• CONTENT STANDARD C: LIFE SCIENCE

Activities meet this standard in part when students learn that organisms are composed of cells, that cells carry on the many functions needed to sustain life, and that every organism requires a set of instructions for specifying its traits.

• CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVE

Activities meet this standard in part when students see that science and technology have advanced through contributions of many different people, in different cultures, at different times in history.

• CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

Activities meet this standard in part when students realize that science has been practiced by different individuals in different cultures.



VOCABULARY

AUTOPSY - an inspection of a body after death, to determine the cause of death.

BIOCHEMISTRY - the science dealing with the chemistry of living matter.

CADAVER - a dead body, especially a human corpse to be dissected.

DENTISTRY - the science dealing with the prevention and treatment of diseases of the teeth, gums, and mouth.

DERMATOLOGY - the branch of medicine dealing with diseases of the skin.

DISSECTION - a detailed, part-by-part examination and analysis.

DNA - deoxyribonucleic acid, which contains the genetic instructions for the development and function of living organisms.

EXTRACTION - the act of removing a part from its larger system.

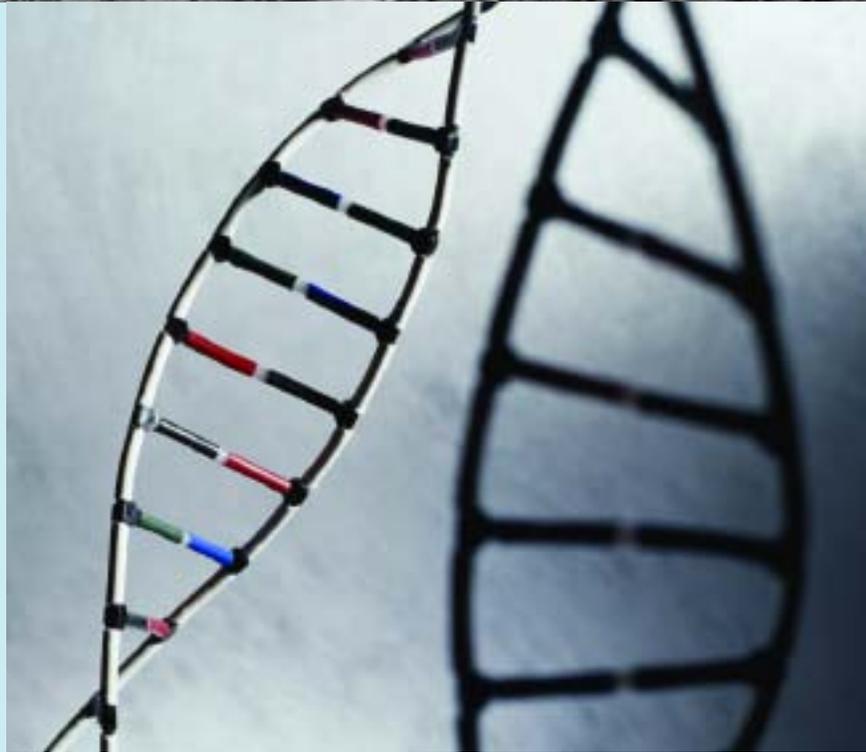
FORENSICS - the use of science and technology to investigate and establish facts.

GYNECOLOGY - branch of medicine dealing with health care for women, especially the diagnosis and treatment of disorders affecting the female reproductive organs.

OBSTETRICS - branch of medical science concerned with childbirth and caring for and treating women in or in connection with childbirth.

OPHTHALMOLOGY - branch of medicine which deals with diseases of the visual pathways, including the eye and its connection to the brain.

POST-MORTEM - occurring after death.



FAST FACTS

A Swiss biologist, Friedrich Miescher, is believed to be the first person to isolate DNA. In 1869, he discovered a microscopic substance in the pus of discarded surgical bandages.

The Ancient Chinese are considered to be the first to use forensic science techniques. Or, at least, they were the first to keep a record of the application of medical knowledge in the solution of a crime. The Chinese book *I DuanYu*, or the *Washing Away of Wrongs*, was written in 1248 to describe ways to distinguish between death by drowning or death by strangulation.

Modern forensic science practice is considered to have started in 1598 with the work of Fortunatus Fidelis, an Italian doctor.

In fictional television programs, forensic scientists often match DNA to a criminal using CODIS. Did you ever wonder what that means? CODIS is the Combined DNA Information System at the Federal Bureau of Investigation. It's a database of DNA profiles for known offenders.



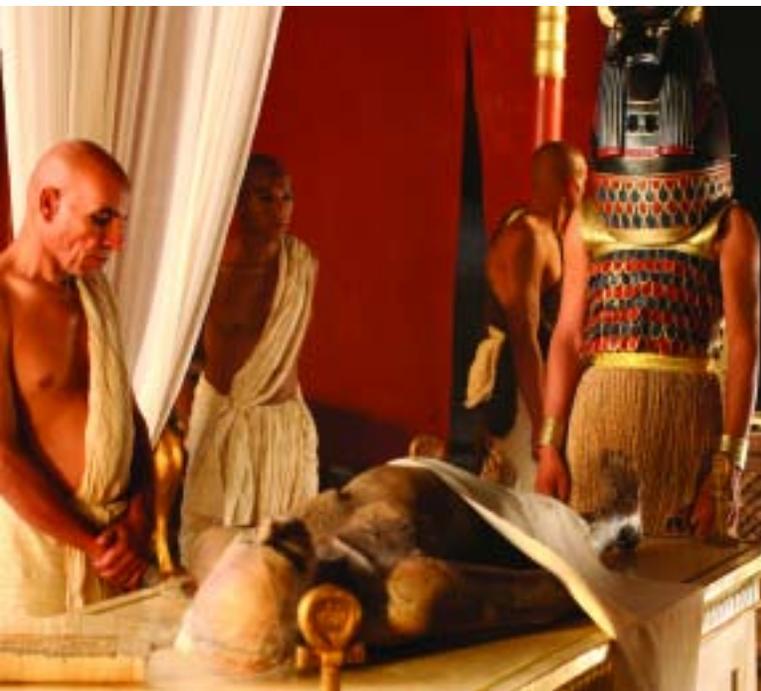
ANCIENT EGYPTIAN MEDICAL PRACTICES

The Ancient Egyptians understood a great deal about human anatomy and practiced an organized system of medicine. While they didn't fully understand the complexities of biochemistry, they made remarkable strides in developing cures for ailments.

In some ways, their understanding of how to treat disease was a result of their devotion to the afterlife. Because of their concern for preserving the body – through mummification – for eternal life, they came to know a lot about what existed inside the body. Their post-mortem practices actually helped them learn a great deal about how living systems work.

Today, autopsies are usually conducted when a person dies unexpectedly or through suspicious circumstances. In Ancient Egypt, however, most bodies were prepared for mummification, so the removal of internal organs became a routine post-mortem practice.

If you decide to pursue a career in medicine today, you will spend many years studying living organisms through post-mortem examinations. Perhaps you have already begun this journey by dissecting an earthworm, frog, or fetal pig in your school science laboratory. As you continue your education, you'll move on to dissections of larger organisms with more complex systems until – in medical school – you will likely encounter a human cadaver. All of this preparation will enable you to help save lives, just as the Ancient Egyptians used what they learned through their post-mortem practices to treat the living.



THE EBERS PAPYRUS

In 1872, a German man named Georg Ebers purchased a 110-page scroll of papyrus in a market in Luxor, Egypt. That papyrus – which came to be known as the Ebers Papyrus – contained a thorough explanation of medical practices in Ancient Egypt as recorded in 1552 BC. Now housed in a library at the University of Leipzig in Germany, the Ebers Papyrus is the oldest and most thorough record of medical practice ever discovered, helping unlock the secrets of daily life among the Ancient Egyptians.

The papyrus contains chapters on intestinal disease, ophthalmology, dermatology, gynecology, obstetrics, dentistry, and the surgical treatment of abscesses, tumors, fractures, and burns. It also includes a surprisingly accurate description of the circulatory system, noting the existence of blood vessels throughout the body and the heart's function as a center of the blood supply. The papyrus also contains a short section on psychiatry, describing a condition of severe despondency that is equivalent to our modern definition of depression.

The next time you visit your doctor's office, look around for the Physician's Desk Reference. Today, physicians rely on a copy of this thick book to “look up” known treatments for symptoms. In many ways, the Ebers Papyrus was used the same way. In the Papyrus, readers find lengthy lists of recommended treatments for ailments. Many of these treatments involve common plants, herbs, and ingredients still in use today.

Try the following activity. In the column on the left, we've listed the suggested remedies used in Ancient Egypt. Have students list modern treatments for these common ailments. Then, compare ancient with modern. Visit the education area at www.mummiesfilm.com for a printable worksheet for this activity.

ANCIENT EGYPTIAN REMEDY	AILMENT	MODERN REMEDY
Honey	Sore Throat	
Garlic	Digestive Problems	
Aloe Vera	Burns	
Mint	Bad Breath	
Poppy Seeds	Headaches	
Sesame Seeds	Asthma	



THE EDWIN SMITH SURGICAL PAPYRUS

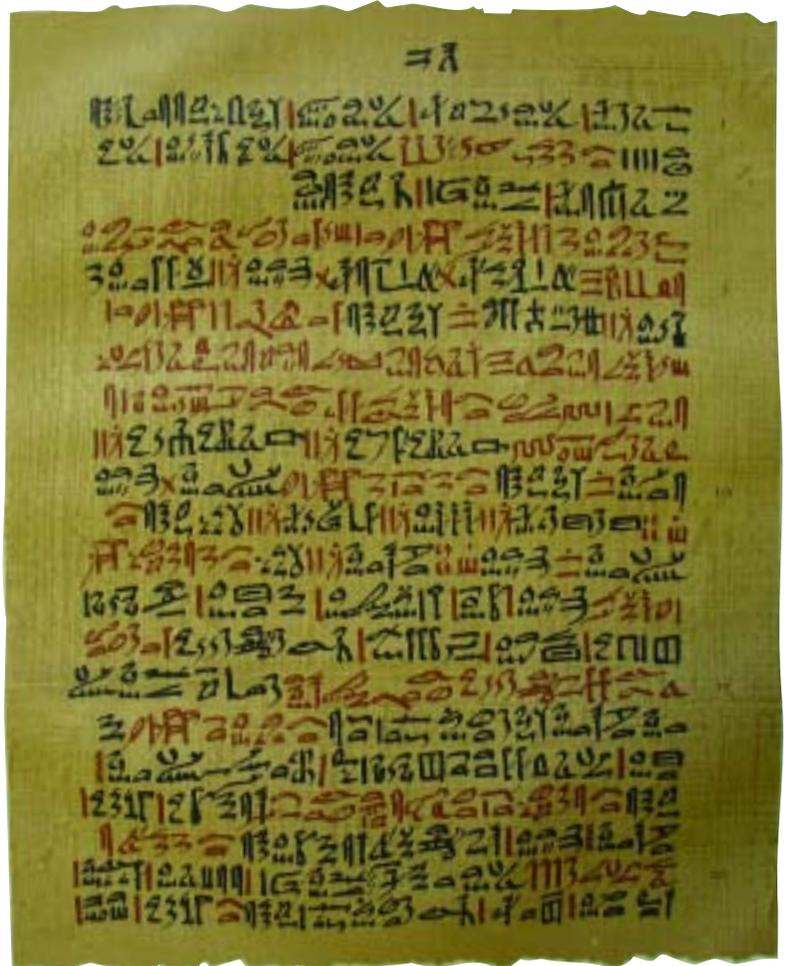
If the treatments suggested in the Ebers Papyrus were insufficient, the Edwin Smith Papyrus might help – it described surgical procedures!

Like the Ebers Papyrus, the surgical papyrus was also purchased at a market in the town of Luxor in Egypt. Edwin Smith was an American living in Egypt at the time. He had a fascination with Egyptology and so became a collector of ancient artifacts. He found the surgical papyrus in 1862, not knowing how important it would become in the understanding of Ancient Egyptian medical practice. Today, the Papyrus is in the collection of the New York Historical Society.

Scholars believe that Imhotep is the original author, although it appears that at least three different authors contributed to the Papyrus, which takes a “case study” approach to the subject of surgical treatment, using 48 battlefield injuries as examples of how to treat traumatic wounds.

Imhotep was a very important person in Ancient Egypt. Today, he is considered to be the first physician known by name in recorded history. Besides developing medical practices, he also influenced Egyptian architecture and design.

The 48 cases are arranged systematically, beginning at the top with injuries of the head and then moving to the spine and the thorax (chest area). Each case offers a title, examination, diagnosis, and treatment. Of the total 48 cases, 27 involve head trauma, with 4 deep scalp wounds, and 11 skull fractures. The following two examples suggest treatments for serious wounds.



CASE TWO: INSTRUCTIONS CONCERNING A GAPING WOUND IN HIS HEAD, PENETRATING TO THE BONE.

Examination: If thou examinest a man having a gaping wound in his head, penetrating to the bone, thou shouldst lay thy hand upon it (and) thou shouldst palpate his wound. If thou findest his skull uninjured, not having a perforation in it...

Diagnosis: Thou shouldst say regarding him: “One having a gaping wound in his head. An ailment which I will treat.”

Treatment: Thou shouldst bind fresh meat upon it the first day; thou shouldst apply for him two strips of linen, and treat afterward with grease, honey, (and) lint every day until he recovers.

CASE TWELVE: INSTRUCTIONS CONCERNING A BREAK IN THE CHAMBER OF HIS NOSE.

Examination: If thou examinest a man having a break in the chamber of his nose, (and) thou findest his nose bent, while his face is disfigured, (and) the swelling which is over it is protruding.

Diagnosis: Thou shouldst say concerning him: “One having a break in the chamber of his nose. An ailment which I will treat.”

Treatment: Thou shouldst force it to fall in, so that it lies in its place, (and) clean out the interior of both his nostrils with two swabs of linen until every worm of blood which coagulates inside his two nostrils comes forth. Now afterwards thou shouldst take two plugs of linen saturated with grease and put them into his two nostrils. Thou shouldst place two stiff rolls of linen, bound on. Thou shouldst treat him afterwards with grease, honey, (and) lint every day until he recovers.



WHAT IS FORENSIC SCIENCE?

The field of forensics, in which forensic science is practiced, uses a broad range of scientific knowledge to answer questions. Frequently, those questions have to do with legal matters such as crimes or civil actions. That common purpose is the reason why the word “forensic” came to represent the activity. From its Latin origin, the word forensic means “before the forum.” That forum was the court of law. However, forensic scientists certainly do solve puzzles that have nothing to do with crime and punishment. For example, Archaeologists and Egyptologists use forensic science techniques to learn about the past.

Forensic scientists always hope to find DNA evidence because it tells them so much about the people who were present at some place in the past – whether it's a crime scene or the banks of the Nile River in Ancient Egypt. Human beings leave DNA evidence behind when we leave even the tiniest bit of our blood, saliva, hair follicles, skin, or semen (if male) behind. It's impossible to deny our own DNA – it's unique to an individual. So, if DNA found in a saliva sample at a crime scene matches our saliva, we must have been there.

In their search for DNA in Ancient Egyptian mummies, scientists are not attempting to connect the mummy with a crime scene. Rather, the scientists seek to access the long-term information stored in the mummy's DNA. It can tell us many things about how the Ancient Egyptians tolerated diseases and what kinds of mutations they may have had.

While finding the DNA in ancient mummies remains a great challenge, extracting DNA from a living person is actually very simple. While DNA molecules are so tiny that you can't ordinarily see them, you can see large clusters of them – thousands of cells at a time. Try the following activity to see just how easy it can be.

EXTRACT DNA!

YOU'LL NEED:

- A small clear glass beaker with a narrow mouth.
(If you don't have beakers, a clear juice glass will do.)
- 1/2 liter of drinking water in a beaker or large glass, room temperature.
- 1 tablespoon of ordinary table salt
- 1 bottle of rubbing alcohol, chilled (Isopropyl alcohol USP 70%)
- Blue food coloring
- A pipette or medicine dropper
- Clear dishwashing liquid - any brand, as long as it's not colored
- Glass or plastic stir stick
(If you don't have laboratory equipment, a plastic knife will do.)
- Measuring spoon or graduated cylinder
- Rubber gloves
- Safety glasses

DIRECTIONS:

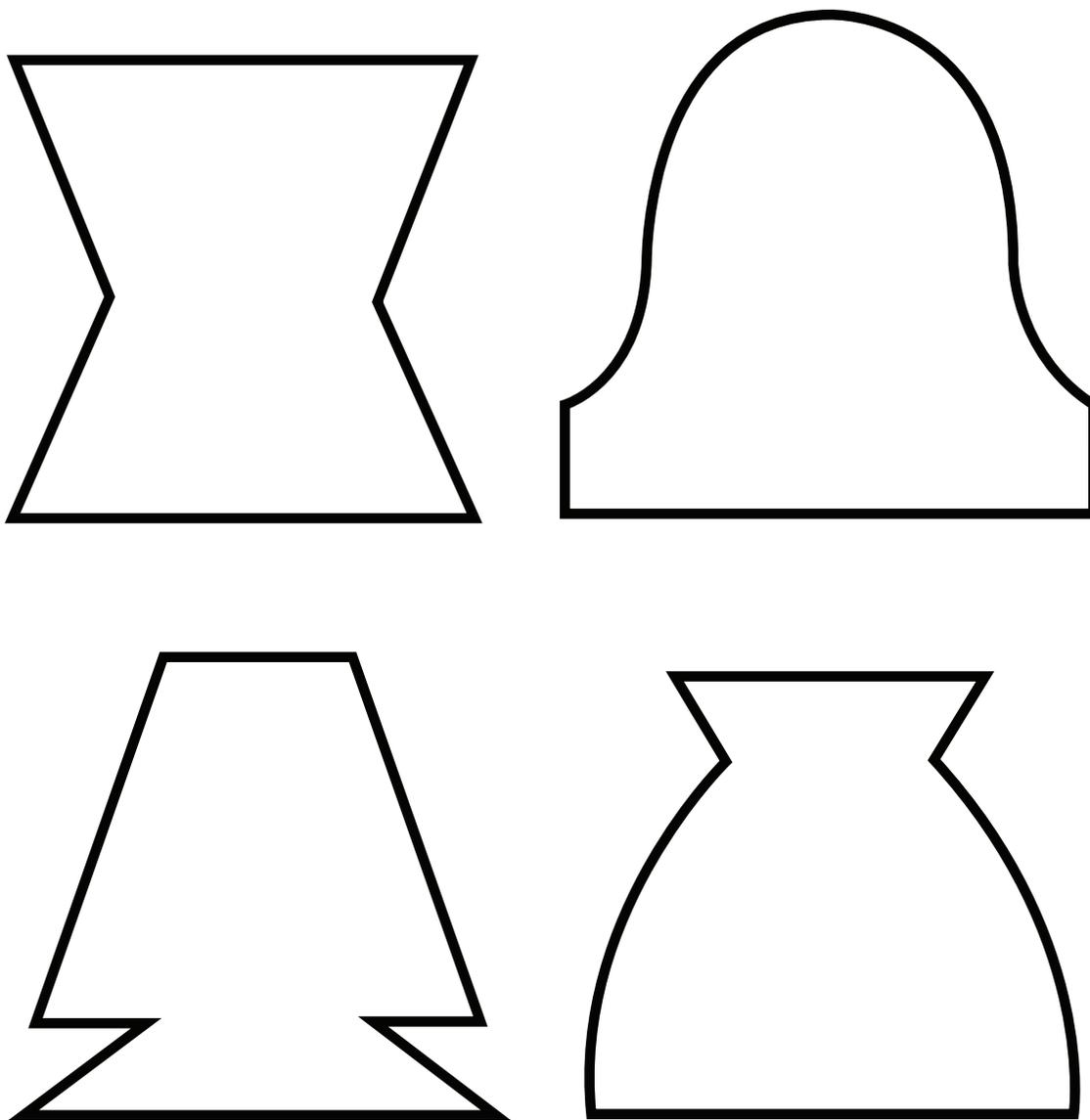
1. Chill the Isopropyl alcohol overnight.
2. Put on glasses and gloves.
3. Pour 1 tablespoon of the salt into the drinking water. Stir until salt is dissolved.
4. Use measuring spoons or graduated cylinder to transfer a sample of 3 tablespoons of the salty water into the small glass beaker or juice glass.
5. Pour the sample of salty water into your mouth. **DO NOT SWALLOW!** Swish the salty water around inside your mouth for about 30 seconds. Spit it back into the cup. You have just collected living skin cells from the inside of your mouth.
6. You now need to add just a drop of the clear dishwashing liquid to the sample. Carefully add a drop to the water and use your stir stick to mix it together gently. Be careful not to create foam. Stir just once, just enough to break the detergent's drop membrane. The detergent will break open the membranes of the skin cells, releasing the DNA from the cell into the sample.
7. Add about 3 drops of the blue food coloring to your bottle of chilled rubbing alcohol. Replace the cap tightly and shake until it is mixed well.
8. Fill your pipette or medicine dropper with the blue alcohol. Hold the glass containing your sample at a slight angle so that you can gently release a slow stream of the alcohol down along the inside wall of the glass. The alcohol needs to rest on top of the water, so make sure it doesn't mix with the water below. Continue releasing streams of blue alcohol until there is a complete layer resting on top of the salty water. You don't need to measure it, but it should be approximately 2 centimeters. Not too thin, not too thick. *Note: If your blue alcohol mixes with the salty water, you'll need to discard the sample and start over.
9. Now, watch as thin strands of your DNA begin to migrate and collect in the alcohol layer. As more and more gather, they'll begin to join together and become visible. Look for webs or mesh-like structures. That's your DNA!



MUMMIES: SECRETS OF THE PHARAOHS

FUNERAL MASK HEADPIECE TEMPLATES

Print this page on a transparency and then use an overhead projector to make it big enough to trace onto a large sheet of cardboard. Have one student hold the cardboard while another traces the outline.





MUMMIES: SECRETS OF THE PHARAOHS

MEDICAL REMEDIES

Try the following activity. In the column on the left, we've listed the suggested remedies used in Ancient Egypt. Have students list modern treatments for these common ailments. Then, compare ancient with modern.

ANCIENT EGYPTIAN REMEDY	AILMENT	MODERN REMEDY
Honey	Sore Throat	
Garlic	Digestive Problems	
Aloe Vera	Burns	
Mint	Bad Breath	
Poppy Seeds	Headaches	
Sesame Seeds	Asthma	

WHICH ANCIENT REMEDIES ARE STILL COMMON TODAY?



MUMMIES: SECRETS OF THE PHARAOHS

The following websites offer more information about the topics explored in *Mummies: Secrets of the Pharaohs*.

ANCIENT EGYPT LESSON PLANS FOR TEACHERS

www.dia.org/education/egypt-teachers/index.html

Created by teachers, these lesson ideas offer a range of topical connections to Ancient Egyptian themes. Be sure to note the Weather and Mummy activities.

ANCIENT EGYPTIAN HIEROGLYPHICS

www.mnsu.edu/emuseum/prehistory/egypt/hieroglyphics/heiroglyphics.html

Visit this site for more information about hieroglyphics and, especially, links to more information about hieroglyphic mathematics.

BUILDING THE PYRAMIDS: NO LIGHT TASK

worldnetva.pwnet.org/lesson_plans/5.htm

Developed by a teacher, this activity vividly demonstrates the task involved in constructing the pyramids. It's a good extension activity for learning about simple machines.

SCIENCE AND CHEMISTRY IN ANCIENT EGYPT

www.touregypt.net/science.htm

This site offers an absolutely wonderful presentation of the science and chemistry understood by Ancient Egyptians. It's intended for an adult audience, although may be appropriate for direct student use. There are some advertising links for commercial purposes, but they are unobtrusive and easily ignored.

ANCIENT EGYPT

www.ancientegypt.co.uk/menu.html

From the British Museum, this site uses the Museum's collections to engage students in an exploration of mummification, hieroglyphics, pyramid construction, and other topics.

MYSTERIES OF THE NILE

www.pbs.org/wgbh/nova/egypt/classroom.html

Originally intended as a companion to an on-air program, this site from PBS offers a range of resources and lesson plans that are appropriate for classroom investigation.

ANCIENT EGYPT SCIENCE & TECHNOLOGY

www.mos.org/quest

From the Museum of Science, Boston, this site offers online activities for students to extend their investigation of Ancient Egyptian science.

THEBAN MAPPING PROJECT

www.thebanmappingproject.com

This site, winner of numerous awards, houses the world's most comprehensive database of information related to Thebes – particularly the Valley of the Kings. This is an important, extraordinary site for enriching understanding of Ancient Egyptian civilization and custom.



SUGGESTED READING FOR ADULTS

ANCIENT EGYPTIAN MAGIC by Bob Brier (1980) ISBN: 0688007961

DAILY LIFE IN ANCIENT EGYPT by Bob Brier (1999) ISBN: 0313303134

DISCOVERIES: RAMESSES II:

GREATEST OF THE PHARAHOHS by Bernadette Menu and Laurel Hirsch (1999) ISBN: 0810928701

EGYPTIAN MUMMIES by Bob Brier (1994) ISBN: 1860199208

ENCYCLOPEDIA OF MUMMIES by Bob Brier (1998) ISBN: 0816031088

THE LOST TOMB by Kent R.Weeks (1998) ISBN: 068815087X

MUMMIES, MYTH AND MAGIC IN ANCIENT EGYPT by Christine El Mahdy (1991) ISBN: 0500275793

MUMMIES AND DEATH IN EGYPT by Francoise Dunand (2006) ISBN: 0801444721

MUMMY IN ANCIENT EGYPT:

EQUIPPING THE DEAD FOR ETERNITY by Salima Ikram and Aidan Dodson (1998) ISBN: 0500050880

THE MUMMY'S CURSE:

MUMMYMANIA IN THE ENGLISH-SPEAKING WORLD by Jasmine Day (2006) ISBN: 0415340225

THE MURDER OF TUTANKHAMEN by Bob Brier (1998) ISBN: 0425206904

THE MYSTERIES OF ABU SIMBEL:

RAMESSES II AND THE TEMPLES OF THE RISING SUN by Zahi Hawass (2001) ISBN: 9774246233

RAMSES: THE SON OF LIGHT - VOLUME I by Christian Jacq (1997) ISBN: 0446673560

SECRETS FROM THE SAND by Zahi Hawass (2003) ISBN: 0500051259

VALLEY OF THE GOLDEN MUMMIES by Zahi Hawass (2000) ISBN: 1852278498



SUGGESTED READING FOR CHILDREN AND YOUNG-ADULTS

- THE BEST BOOK OF MUMMIES** by Philip Steele (2005) ISBN: 075345873X
- CAPTAIN FACT: EGYPTIAN ADVENTURE - BOOK #4** by Knife and Packer (2005) ISBN: 0786855746
- THE CURSE OF THE PHARAOHS: MY ADVENTURES WITH MUMMIES** by Zahi Hawass (2004) ISBN: 079226665X
- GERONIMO STILTON THE MUMMY WITH NO NAME** by Geronimo Stilton (2006) ISBN: 0439841178
- EGYPTIAN MUMMIES** by Henrietta McCall (2000) ISBN: 0531164438
- EGYPTIAN MUMMIES: A POP-UP BOOK** by Milbry Polk and Roger Stewart (1997) ISBN: 0525458395
- ICE MUMMY** by Cathy East Dubowski (1998) ISBN: 0679856471
- JIGSAW JONES #06: THE CASE OF THE MUMMY MYSTERY** by James Preller (2001) ISBN: 0439080940
- JOE SHERLOCK, KID DETECTIVE, CASE #000004: THE HEADLESS MUMMY** by Dave Keane (2007) ISBN: 006076192X
- THE LIFE & TIMES OF RAMESES THE GREAT
(BIOGRAPHY FROM ANCIENT CIVILIZATIONS)** by Jim Whiting (2005) ISBN: 1584153415
- MUMMIES AND PYRAMIDS** by Will And Ma Osborne (2001) ISBN: 0375802983
- MUMMIES MADE IN EGYPT** by Alike (1985) ISBN: 0064460118
- MUMMIES: THE NEWEST, COOLEST, AND CREEPIEST FROM AROUND THE WORLD** by Shelley Tanaka (2005) ISBN: 0810957973
- MUMMIES AND THEIR MYSTERIES** by Charlotte Wilcox (1993) ISBN: 0876147678
- MUMMIES OF THE PHARAOHS: EXPLORING THE VALLEY OF THE KINGS** by Melvin Berger (2001) ISBN: 0792272234
- MUMMY: UNWRAP ANCIENT SECRET** by Joyce Tyldelsey (2002) ISBN: 1858687713
- MUMMY (DK EYEWITNESS BOOKS)** by DK Publishing (2004) ISBN: 0756607078
- THE MYSTERY OF THE EGYPTIAN MUMMY** by Joyce Filer (2003) ISBN: 0195219902
- OUTSIDE AND INSIDE MUMMIES** by Sandra Markle (2005) ISBN: 0802789668
- RAMESES II: RULER OF ANCIENT EGYPT** by Don Nardo (2006) ISBN: 0766025624
- RAMESES II: PHARAOH OF THE NEW KINGDOM** by Susanna Thomas (2003) ISBN: 0823935973
- SCIENCE QUEST: DOUBLE HELIX:
THE QUEST TO UNCOVER THE STRUCTURE OF DNA** by Glen Phelan (2006) ISBN: 0792255410
- SEE-THROUGH MUMMIES** by John Malam (2003) ISBN: 076241586X
- TUTANKHAMUN: THE MYSTERY OF THE BOY KING** by Zahi Hawass (2005) ISBN: 0792283546
- YOU WOULDN'T WANT TO BE AN EGYPTIAN MUMMY!** by David Stewart (2000) ISBN: 0531162060

MUMMIERS

Secrets of the Pharaohs



The Franklin Institute
Science Museum

Mummies: Secrets of the Pharaohs follows researchers as they piece together the archeological and genetic clues of Egyptian mummies. In addition to increasing our understanding of the culture, religion, medicine, and daily life thousands of years ago, scientists today are reconstructing mummy DNA and deciphering ancient texts to gain insight into modern human genetics and advance medical treatments. To unravel the secrets of the pharaohs is to perhaps glimpse the future of our own civilization.

www.mummiesfilm.com

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