Video Transcript - Mummy Science – Natural and Cultural Preserved Remains

Announcer: The ancient Egyptians are known for preserving the bodies of their rulers after death, but these mummies aren't the only human remains to survive the rigors of time. How can naturally-mummified remains also help tell stories of people who lived long ago? Scientists are using the latest technology to unlock portals [00:00:30] to the past, discovering the secrets of lives lost in history. Join us now for a conversation with Anthropologist David Hunt to unwrap the mysteries of mummies. Now, here's your host, Maggy Benson.

Maggy Benson: Welcome, everyone. Thanks for joining us for another episode of Live from Q?rius, Smithsonian Science How? I'm Maggy Benson. Really excited about our show today. With us now is Physical Anthropologist from the Smithsonian's National [00:01:00] Museum of Natural History, Dr. David Hunt. Thanks for joining us, David.

David Hunt: I'm glad to be here.

Maggy Benson: Let's start off by having you tell us what a physical anthropologist is.

David Hunt: A physical anthropologist is a person who studies human remains. They can be from both an archaeological context or in things that we know today more on TV, the forensic anthropologist. But our study is to look at the human remains, the skeletons, and we get information from those skeletons to identify their [00:01:30] sex, their age, their ancestry. We use those individuals then to look at population groups, particularly in an archaeological context.

Maggy Benson: Interesting. You can find out the sex of a person, if they're a male or female or the age just by looking at their bones?

David Hunt: Yes. They sure can.

Maggy Benson: Can you show us how?

David Hunt: Yeah. Okay. First of all, I have here the thing that's the most important and the most diagnostic for sex of an individual is the pelvis, because it is directly genetically driven. [00:02:00] What you can see in these two here, inside here, you can see the pelvic inlet in females is wide, and in males, it is narrow, so-

Maggy Benson: I see. This one is clearly wider than the other.

David Hunt: This one here is the male, and this one here is the female, okay? You can see this one here has a rounder shape, whereas this one has more of a triangular

shape, and also, this shape is made different by this, what we call the 'Sciatic notch' right here.

Maggy Benson: Right here.

David Hunt: These right here, [00:02:30] and on the female, it's wider, and on the male, it's more narrow, and so you'll see that as well. These are the features that we would use as an indicator for the sex of the individual.

David Hunt: Then, we also know the age of the individual, and the age of the individual is often based on, for adults, is based on the amount of arthritis that's on. You can see in this individual here, these are four separate people, okay? This person is from around, in their 20's, this one from their 30's, [00:03:00] this one from their 40's or 50's, and this one in the older age, and you can see these edges that are along the body.

Maggy Benson: A lot rougher with the older individuals.

David Hunt: Yeah, more rough. Yeah. You see these, and these are enthesophytes or bone growth that is influenced by the fact that the soft tissue that's between the vertebra or between your joints is beginning to go away and you're getting growth that's taking place, which is the arthritic growth that we have.

Maggy Benson: Interesting. You can tell a lot by a person just by their [00:03:30] physical remains.

David Hunt: Yes.

Maggy Benson: You mentioned also archaeological context. Can you tell us more about that?

David Hunt: In an archaeological context, what you're looking for is the material culture that is there, and then also the biological materials that are there, and so we work with the archeologists, and the archeologists are usually digging and looking at the house structures, other things that are there. In this particular instance like you see here, this is where the physical anthropologists and the archeologists work together. This is a mound. This is a burial [00:04:00] mound, and you can see that that was very elaborate. This comes from the Middle East, and then you can see that the excavations take place with the physical anthropologists and archeologists together, but then the physical anthropologists are called in to look at the bones and identify the people who are in there, and these people give us indications of what their status was, and we're looking at the pottery.

David Hunt: You saw the pottery that's in there, and you'll see arrowheads and other things like that. They get the cultural [00:04:30] aspects that they're looking at, and we give the biological aspects of the people who were making or building those houses or making those pottery, and their health, their life, and their death, and what was going on during that time period.

Maggy Benson: Wow, so you can really learn a lot about a person or population and their culture from these physical remains and the artifacts that they're buried with.

David Hunt: Yes.

Maggy Benson: This show today is about mummies in particular, so I really wonder what makes mummies so special. Should we ask our students?

David Hunt: Yeah. [00:05:00] Let's do.

Maggy Benson: All right. Here's an opportunity for you to answer a live poll with us. You can respond using the window that appears to the right of your video. Tell us. Mummies are special because They are found in large groups? They come with trappings such as clothing? They have soft tissue preserved? or They never decay?

Maggy Benson: Take a moment to think about it, and put your answer in the window to the right here, and remember that this is the same place that you can post questions for Dr. David Hunt to answer during today's program. [00:06:00] David, the results are still coming in, but the majority of our viewers, 69 percent currently think that mummies are special because they have soft tissue preserved. How'd they do?

David Hunt: Very good. Yes. When we're looking at skeletons as physical anthropologists, we get some of that information, but by having soft tissue, that gives us even more information about the cause of death of the [00:06:30] individual that might have taken place, and also the, whether they had particular diseases or other injuries that might show up on the tissue. Sometimes, we even see things like tattoos.

Maggy Benson: One of the answers there was that they're found in large groups. Are mummies found in large groups or not as much?

David Hunt: It all depends on the area. Usually, it's a very unique thing for a mummy to be made, and you'll find that when cultural intervention takes place, [00:07:00] and particularly in Egypt, then you have large groups that might be buried, but usually, it's a very unique place where you find one person in a cave, or just the particular environment that maybe a couple people might be from.

Maggy Benson: Can you give us a technical definition of what a mummy is? Maybe we should start there.

David Hunt: A mummy is something, is any body that something has happened to it either by natural occurrence, [00:07:30] or by something that's been done by a culture that will take that dead body, and it slows or inhibits the natural decay process, and so therefore, it's preserved.

Maggy Benson: Our second most popular answer in that last poll was that mummies never decay. Is that true?

David Hunt: No. They will eventually fall apart, but depending on whether they stay in their natural environment. If they stay in their natural environment, or that particularly unique environment, if they stay in that environment, they will survive [00:08:00] for thousands of years, but if that environment changes, then we will lose things. Like this example that we see right here, this is an Egyptian mummy that has been removed from the sand, and when it was removed from the sand, it began to smolder, and actually the oxygen, the exposure to the oxygen caused the bitumen, the tar-like substance, to begin to smolder. It actually caught on fire.

Maggy Benson: [00:08:30] Therefore, the mummy completely decayed.

David Hunt: Eventually, it burns to ash, or as you see there, or carbonized material like you see on the table right there, so you have to work on that mummy really fast once you've removed it to be able to learn things from it before it's gone.

Maggy Benson: You mentioned that you also learned from the artifacts that a person can be buried with sometimes, so what about the trappings that mummies are buried with? Do they survive?

David Hunt: Yes. That's one of the [00:09:00] other great things about mummies, is not only does the tissue survive, but all of the materials that would be with that person, whether it was things that were given as gifts to the person, or clothing that they were wearing, and so like we have examples of the coffin here, but there's cloth materials, and we have here, as example here, these are from Peru, and so these are pieces of clothing that come from a netting that would have been used for probably fishing or something like that.

Maggy Benson: This right here.

David Hunt: Yeah. [00:09:30] Then also, in front there, they often wear woven to have particular designs, and many instances, those designs were specifically made for burial, so they were not in ... There, you have daily clothes, and then you have actual burial clothes that were made.

Maggy Benson: I see something else that almost looks like a hat on the other side of the table. What's that?

David Hunt: Yes. In one of the iron coffins that we worked with, this is a bonnet, a head bonnet that was worn by the woman that [00:10:00] was in the coffin, and so you can see how well-preserved this is because there's lace that's all around in this edge right here and of a little wire that was holding it all together. It's all still in one piece. Then, there's the hairpins that were used to hold this on her head.

Maggy Benson: With some hair. How old is this?

David Hunt: This comes from 1852. The person was buried in 1852.

Maggy Benson: Interesting.

David Hunt: Also, you see in that picture there the hairpins, but also I have in this box right [00:10:30] here, these are flowers that were found around her neck. She had this little necklace of flowers that were around her, and they're here at our department, at the Department of Botany. They identified what type of flower this was for our report.

Maggy Benson: Interesting. You can really learn a lot about the culture based on some of the trappings that mummies are buried with.

David Hunt: Yeah.

Maggy Benson: I see some of the things on the table look very fragile. [00:11:00] How do you actually study them without damaging?

David Hunt: One of the things that we try to do here at the Smithsonian Institution is to be able to study things and cause the least amount of damage to something so it'll be available for future research. Often, we'll use radiographic techniques to be able to study the insides of, in particular for our purposes, mummies. You can see like in this picture here, we use CT scanning, and this is scanning through one of our iron coffins, and you could see the [00:11:30] head that was produced in a three-dimensional image. This is a two-dimensional image that comes from regular radiography of a little boy, a little Egyptian boy, and where you can see he's also then going through the 3-D scanner so that we can see ... In the CT scanner, we can see his teeth that are there, and this gives us the ability to be able to identify his age.

David Hunt: Yes, right here. You can see his baby teeth are there, and then his permanent teeth are coming in, [00:12:00] and so we could get about a three years of age identification for that child.

Maggy Benson: His baby teeth are below.

David Hunt: This one here is a Mongolian mummy, and you can see when you look on the left-hand side, the damage that's to the face, but what is that damage? Through the 3-D CT, we can see the bone fragments that are there and the fragments that have taken place, fracturing that's taken place around the mouth that this person sustained a blow to the middle of their face from that injury.

Maggy Benson: How old is this mummy?

David Hunt: [00:12:30] This mummy comes from around 500 B.C., so about 3,000 years old.

Maggy Benson: Wow, that's incredible.

David Hunt: Yeah.

Maggy Benson: I see an iron coffin. You already mentioned one before, but I see one right over your shoulder here.

David Hunt: Yeah, I brought down here an iron coffin. Now, this one is a baby coffin, so it has a little baby in it. This one comes from around Washington D.C., and if you look at the pictures behind over here on the lower two, show the CT scans of the inside of which you can [00:13:00] see the little baby inside of the coffin, but we have not-

Maggy Benson: Without ever opening it.

David Hunt: We've never had to open the coffin to be able to see and be able to take measurements and know about the little baby that's inside.

Maggy Benson: It's really interesting how you're using modern medical technology to be able to study these mummies in both their trappings, the things that they're buried with, and their actual physical remains.

David Hunt: Yeah, even when you have the opportunity to be able to study mummies if they're partially unwrapped, such as like the Mongolian mummy. We [00:13:30] use an endoscope, just like they use for surgeries these days to be able to see on the inside of a mummy.

Maggy Benson: A camera on the end of almost a pole?

David Hunt: Right. Right.

Maggy Benson: This question comes from Anaya and Sophia.

David Hunt: Okay.

Maggy Benson: Will everyone become a mummy?

David Hunt: That's a very good question too. No. Most people don't become mummies. Most people will go through their normal decay process. Even with our embalming that we do today and in coffins and [00:14:00] things like that, we will eventually go through a decay process, and we'll go back to the elements that we started from, but in a unique experience, then they will ... You can have a body that will stay preserved.

Maggy Benson: We have another question, and this one is actually a video question, so let's take a look.

David Hunt: Okay. All right.

Josh: Hi, my name is Josh, and I wanted to know where were mummies buried?

David Hunt: Wow, where mummies are buried. All over the world. [00:14:30] Mummies are found all over the world. They-

Maggy Benson: Really?

David Hunt: Yeah. Most of us think about Egyptian mummies, but as I said, a mummy or a body, a desiccated body or a dehydrated body can be found anywhere in the world. That special or unique environment that somehow or another changes or inhibits the body from going through its normal decay process.

Maggy Benson: You've worked here at the Smithsonian and studying some of our collections. Where have the mummies that you've studied [00:15:00] come from?

David Hunt: From North America, from South America, from Egypt, from the Eastern Asia, from the Middle East, from Otzi from Italy.

Maggy Benson: All over the world, again, we're seeing this global distribution.

David Hunt: Yes. Yeah.

Maggy Benson: I wonder what conditions actually cause mummification given that mummies are found all over the world.

David Hunt: They are found all over the world, and yes, I think you have a question to ask [00:15:30] the students about that.

Maggy Benson: I think that's a great idea. Students, here's another opportunity for you to do a live poll with us now. Tell us what you think. What conditions cause mummification? Dry, Swampy, Hot, Cold, Acidic, or Basic conditions? Take a moment to think about it, and put your answer in the window to the right of your video screen.

Maggy Benson: David, [00:16:00] the results are coming in. We're both taking a look at them live. The only answer not picked was swampy, but overwhelmingly, our viewers think dry. [00:16:30] You're the expert. What conditions are best?

David Hunt: All conditions.

Maggy Benson: All of them? Trick.

David Hunt: Depending on what happens. All of them. Now, I would go with what most people went with in the sense that dry is what we normally think of, in the Egypt and in other parts of the world, the preservation being that you draw the

fluids that are the normal bacterial breakdown away from the body that slows the body's chance to fall apart, but-

Maggy Benson: Now, I'm like most people. [00:17:00] I think immediately of Egypt and I think of it being dry, hot and sandy. Is that one of the reasons that there are so many mummies there?

David Hunt: Oh, yeah. Exactly, because the Egyptians actually first started in Predynastic periods of-

Maggy Benson: How long ago was that?

David Hunt: Around 6,000 B.C., where they buried people in the ground, in the sand, but the sand worked as a natural desiccant, and the hot and arid environment that they're in preserved the body. Then [00:17:30] they said, "Okay. These are the incorruptibles. These are our gods, so we're going to put them in crypts." Now, what did we do?

Maggy Benson: You changed the conditions.

David Hunt: You changed the environment, didn't you?

Maggy Benson: Are they going to decay now?

David Hunt: Now, they're going to start decaying. What the Egyptians did then is they started wrapping the bodies up to try to keep them together. But that kept the bacteria and the water inside the body, so it started falling apart. So then they started using the salt and natron and materials to be able [00:18:00] to dry the body, and they continued to do the wrappings, and they would bury these people now in these crypts, but now they had gone through a very high level amount of cultural intervention to be able to preserve the body.

Maggy Benson: To preserve.

David Hunt: All people were supposed to be preserved, not just the Pharaohs.

Maggy Benson: Some of the things that we just saw there, were they buried with these people? I even see a cat here that you brought today.

David Hunt: Yes. Yeah.

Maggy Benson: Did they mummify [00:18:30] animals?

David Hunt: They mummified everything. Not-

Maggy Benson: Were they their pets?

David Hunt: They ... No. Generally, they weren't their pets. Generally they were made ... They were raised to be actually dispatched to make mummies that were given as votive gifts at the sanctuaries of the various different gods. Because their gods were represented by various different animals. So you would go and you would give like a cat mummy as a gift to Bastet to ... You would have that, and that cat was going to help [00:19:00] you to the afterlife. So you did this during your lifetime, you did it with cats, you did it with crocodiles as you see.

Maggy Benson: These are crocodiles?

David Hunt: These are little baby crocodiles here.

Maggy Benson: They're teenie.

David Hunt: They're itty-bitty, little, teenie ones, and we've CT scanned those, but also, there's a picture of a slightly larger crocodile. This one would be about maybe a foot and a half long, and you can see the crocodile on the inside with some dirt that's on the bottom of it as well.

Maggy Benson: [00:19:30] Here are some ancient Egyptian animal mummies, but what about the human mummies? Do we have any of those here at the Smithsonian?

David Hunt: We have quite a few mummies from the Smithsonian, yeah, at the Smithsonian from Egypt and from other parts of the world. The Egyptian mummies and the cat mummies and other animal mummies are on exhibit right now at the Eternal Life in Ancient Egypt exhibit that's in here in Natural History.

Maggy Benson: Who are we looking at here?

David Hunt: This is a person called Minister Cox, who [00:20:00] is actually ... It was a merchant in Egypt.

Maggy Benson: Not a Pharaoh like King Tut?

David Hunt: Not a Pharaoh. No. This person had some means. Like I said, he was a merchant, and we've studied him by using CT scanning, and you saw that cross section of him in there. He's from the Ptolemaic period, so you can see that the coffin that you see leaning up against the side there is not really, really fancy again, like you think of Tutankhamun, but he does have the cartonnage, which are the headdress, [00:20:30] the head/face cast, and the things over the front that indicate his status. Also, you can see with using the CT scanner, you can see the bones of the feet and the tissues around the feet and the wrappings around the feet, and then you can also see the wood that the coffin was made of and how they put it together for using the CT scanner.

Maggy Benson: Clearly, mummification was a central part of Egyptian culture both early in time when they were sand mummies, and now [00:21:00] when they have elaborate burials and tombs such as that.

David Hunt: Right. Yeah. The sand mummies as you had mentioned are all over the place. There are thousands and thousands and thousands of them.

Maggy Benson: Is there another culture that preserves their people, they mummify them on purpose?

David Hunt: Yes. I think one of our other best-known mummy groups that a lot of people might identify with are those that come from South America. As we showed some of these in South America, it's usually mostly along [00:21:30] the western side, so as the students said, dry was their best choice, and that is a very dry region of South America, all along the Western Coastal region.

Maggy Benson: Do you have an example of a mummy from South America today?

David Hunt: I do. There's a skull of one that you see right there that would have been one of these ones that was wrapped, and I have a little baby that I'll show you too, but you can see the headdress that this individual has. This little baby that I have over here is also another one of those [00:22:00] like that. This one here, you can see the child's head is exposed in the wrappings.

Maggy Benson: Wow.

David Hunt: What the wrappings that you see here, the head is ... I'm going to slide it down here so that I can prop it up a little bit further. You can see this is actually exposed here, and then the wrappings of the body cover the rest of the body. This is more mummified than you see up here on the upper portion of the head.

Maggy Benson: How did you look into this wrapping?

David Hunt: [00:22:30] We used CT scanning again for looking at this individual, and we could see on the inside, you can see the child's head, and you can see the body, and it's in a flexed position. We can take measurements of the bones so that we can get an age, as well as we can look at the teeth like we did in that other one that you saw that, where you can see that their ... This was about a child of about seven or eight months old.

Maggy Benson: Both the South American example and the Egyptian examples were clearly cultural [00:23:00] preservation. Have there ever been a mummification of human remains that were totally accidental?

David Hunt: Quite a number of what we find as mummies are the accidental mummies, and those are ones that are truly that unique position of either being frozen or being in a swamp. When we talked about swampy regions, we have people who die

because it was an anaerobic environment that was covered by silt, and they were preserved that way, [00:23:30] and there's also chemical processes that change the body as well. A particular example, you show it ... In Philadelphia, we have an individual who was buried in their coffin, and the coffin filled up with water that was seeping in from the ground, the ground around it, and the ground around it was alkaline, and so the body of the individual chemically changed into what we would identify as soap.

Maggy Benson: The chemical [00:24:00] reaction actually turned that person's tissues into soap for mummifying them and allowing you to study that person?

David Hunt: Into soap. Right, so we could do CT scanning again of this individual, and we can see their internal organs because the organs are covered by a fatty deposit, and that fatty deposit is what's changed. And the muscle tissues as well. So you can see the lungs, you can see the heart, you can see the diaphragm. You can see all sorts of inside internal organs that are in there, as well as you saw some of the bone [00:24:30] pieces that are there of what's the skeleton, which would otherwise preserve and that would not.

Maggy Benson: I have to ask, this person was buried in a coffin. Does everybody buried in a coffin turn into a mummy?

David Hunt: No. These days, with the embalming that we do, because it slows down the bacterial normal decay, they will last for a longer period of time, but even then-

Maggy Benson: What about the iron coffins that you mentioned?

David Hunt: The iron coffins are ones in which they were sealed shut, and so they [00:25:00] reach a stasis that makes it so that they don't go through aerobic or anaerobic bacterial change. It will eventually happen over hundreds of years, but you can see that the distribution of these, and you can see this is opening up a little boy that comes from Washington, D.C.

Maggy Benson: How long ago?

David Hunt: This, he would ... He died in 1852, and so you can see, he was essentially in a state in which we could do a full autopsy.

Maggy Benson: [00:25:30] What did you find by researching this person?

David Hunt: We were actually able to identify him eventually from his DNA by doing genealogical research. We were able to identify here as we were talking about clothing being preserved, and then he's being CT scanned where we can see the facial features that were inside there, but we did DNA on him, and we were able to identify him as William Taylor White from descendants.

Maggy Benson: That's incredible. As an anthropologist, you really put all these pieces [00:26:00] of a puzzle together to come up with who this person was and actually identify them. Can you actually tell what that person looked like during life? I saw that CT scan, and he looked very ... I mean, you can almost imagine what he looked like.

David Hunt: Well, in some ways, you can imagine what he looks like, but we have the techniques with a forensic artist today that can do facial reconstructions from either photographs or from, such as William's face, and from the skull. You see here we had a CT of his skull, [00:26:30] and by virtual clay being applied to the CT scan, we made a facial reconstruction of what William look like. Then, another one with the facial re-livening as you see here, this is the best artist's rendition of what he would look like, and this is Linda Dwyer, who on the right-hand side, who is the person who donated her DNA, and we identified her as being the great, great, great grandniece of William Taylor White.

Maggy Benson: That's incredible. You're actually able to [00:27:00] get a match to a living descendant. David, all of these artifacts and some of these mummies are actually in the museum's collection. Why keep them?

David Hunt: For present day research and for future research. We want to be able to answer questions and reinvestigate questions that have been posed previously, and with the collections that we have here, we can reinvestigate those things, so such as you see here, those were [00:27:30] skeletons that come from one of our anatomical collections. This is also the anatomical collections. We have around 33,000 skeletons in our collections.

Maggy Benson: Maybe for all the physical anthropologists, future physical anthropologists watching today, they can come to the Smithsonian and study these collections.

David Hunt: I certainly hope so.

Maggy Benson: Can you tell our audience where they can learn a little bit more about this kind of work?

David Hunt: You can go online and look up mummies and mummification, and you can go to [00:28:00] the American Association of Physical Anthropologists' website, and you can find out what physical anthropologists do, but also, when you're looking at that association website, or just look around in your local area and find out what universities are in that area, and go and talk to the people who are there in the Anthropology Department.

Maggy Benson: Great Advice. Thank you so much.

David Hunt: Sure.

Maggy Benson: Thank you all for tuning in and asking so many awesome questions. If you missed part of this program or want to see [00:28:30] it again, it'll be archived later this evening on Qrius.si.edu.

Announcer: Thanks for watching. You can explore more Smithsonian Science How? shows and teaching resources on our website, Qrius.si.edu.