

>> Greetings. It's February 6th. It's still 2017. And this is our very first lecture in your favorite course, general human anatomy. And, what does the word even mean, anatomy? It's rather an ancient term, of Greek derivation. The word itself means to cut up. And there's a fair amount of cutting involved in the discovery of anatomy. But, as a broader definition, a more modern definition, anatomy is the study of the composition, that means the make up, the organization, and the overall it design of any living system. Whether it's a bug, or a plant, or a human body. So, this is generic. Anatomy is the study of the organize, the composition, of anything biologically living. In human terms, then, it would be the study of the composition and organization of the human body. Now, this field of study is ancient, meaning humans have always been interested in humans. And so, as the science evolved, at first, it was only, and limited to, what's more popularly known as gross anatomy. Now, the word gross has connotations that really are off the mark. To a lot of people, gross means disgusting, or somehow unsavory. But actually, gross simply means large, or big. And so, a more proper reference to gross anatomy is macroscopic. Macro means what? Big. And scope means the view. So, translated, macroscopic means the big view. And, naturally, historically, anatomy at the beginning was only macroscopic, because there were no tools, really, to study anything more. In other words, macroscopic is the study of the body, using your eyes and your senses. As a study, macroscopic can be approached, catalogued, organized in two arbitrary ways. One's called regional approach. The other is systemic. So, if you've looked over your book, think about it. How are the chapters laid out there? Is it, is it organized by body systems, or is it organized by regions? It's actually systems, like the circulatory system, the respiratory system, and so forth. That doesn't mean that's the best way. It's just the way your book chooses to go. Regional anatomy basically covers certain regions, like the head, the chest, the extremities, and so forth. So, for better or worse, what approach are we going to use in this course? Not regional, but systemic. And some of the early systems that we'll consider are the skeletal system, later the muscular system. You know, nervous system. The ones that are familiar and obviously easy to delineate. Now, once the instrument known as a microscope was invented, and become available, then a whole new region, that is, a whole new world of anatomy opened up. And that, as you'd expect, is called microanatomy. What's micro mean? So, translated, microanatomy means the small view. Invisible to the naked eye, and naturally requiring microscopes of various sophistication. Here's one of the early microscopes. This is just a joke. But, it says, oh, it's a mammoth. Not that funny. Okay. But microscopic anatomy can be divided, subdivided, into even further categories. That is, we can study microanatomy at the tissue level. And that's called histology, the study of human tissues. And even smaller, at cellular level, the study, this science is called cytology, the study of cells. So, naturally, in this course, we'll study macroscopic anatomy. We'll also study microscopic anatomy. And almost always, we'll be breaking down microanatomy to the histological level, and also down to the cellular level. So, today we have not just gross anatomy, but we have the world of microscopic anatomy as well. Good to go? Today's lecture, basically, now, then, just an

introduction of some jargon. Some language. No matter what course of study you get involved in, there's always a language of its own. And so, there are references and words and vocabulary that are unique to the study of anatomy. And we'll expect you to is adopt them, and make them your own. Because we just can't have people using street language for a science such as this. To start, then, when we describe surface anatomy, or any anatomy on the macroscopic level, we have to assume, we have to visualize, a basic body posture or stance. And that's called SAP, which stands for standard anatomical position. SAP. Now, I've been practicing all morning, so I'm anxious to perform this. Please don't try this at home. And please hold your applause until I'm done. But, I am about ready to perform for you, what? Standard anatomical position

>> Okay, thank you. That was it.

[Scattered applause]

I know. But I've had years of experience. Now, what was so tricky there? Well, how would you describe that view, that posture? Was I standing? Yes. Were my feet together? Yes. Palms were what? Open and forward. So, those are descriptions, which describe SAP. And you might think it's stupid, or unimportant. But certainly the body is capable of assuming many different contortions, so we have to begin with, and assume, something like standard anatomical position. In fact, this guy's not doing a very good job, is he? Not at all. Because his feet are not together. And certainly his palms are not open, or facing forward. So, let's be clear. I'll do it again, in case you missed it, because it did go by fast. There it is. Okay. Now, with that in mind, let's describe some aspects of description, and let's break down some of these terms and ideas into sections. First, those that pertain to direction or physical location on the body. Most of those terms come in opposite pairs, that is, words that mean the opposite of each other. First, then, superior versus inferior. When you hear the word superior, you think good. And when you hear the word inferior, you think oh, bad. But actually, the word superior literally means anything what? Toward the head. And inferior is anything away from the head, meaning toward the feet. In zoology, the study of animals, sometimes instead of superior, the word cephalad will be substituted. Cephalad meaning head. And because many animals have tails, the alternative to inferior is a word which references a tail. That's called caudad. We're not going to use these. Instead, we'll always use superior and inferior. And so, let's develop a description of something that you know about. Namely, let's start with the fingernails. Using one of these two terms, the fingernails are blank to the wrist. Are they superior, or inferior? Inferior. Good. Now, some of you might argue, I don't know what you're talking about. There's my fingernails, and they are above, or superior to, the wrist. But that totally disregards what rule or reference that we insisted on? SAP. So, in standard anatomical position, the fingernails are indeed, or better be, inferior to the wrist. If yours are some where else, let me see that. I want to get a photo. Put it up on You Tube. We'll make sure that everybody knows. Because yours are different. Good on this? Next. A pair of words, meaning, again, the opposite

of each other, anterior versus posterior. Anterior means anything that's going forward, or going first. And therefore facing front, you could say. In zoology, the word ventral is used. Posterior is the opposite. That means that which goes behind, that which goes last. That which faces the back. And, in zoology, that is sometimes replaced by dorsal. We're also use dorsal from time to time. But we're going to use, most often, anterior versus posterior. So, referring back to our fingernails, I got that spelled right, don't I? Are the fingernails oriented, are the fingernails facing anterior or posterior? All right. I know this is not too hard, but here I go. So, are these fingernails anterior or posterior? They are posterior. Assuming what? SAP. Standard anatomical position. So, the fingernails are oriented or facing posteriorly, normally. Good enough. Next two words are a bit tricky, because their use is sometimes misused. The words are proximal versus distal. Proximal very literally means at the beginning of something. At the start of some continuous structure. Something that has a definite beginning and a definite end. The opposite of proximal is? Distal. And naturally, that means at the end of something. In fact, you can almost get that from the word, because distal reminds you of distant, right? Distant, away from the beginning. So, with that introduction, how would you place the fingernails? Do they form the proximal, or the distal end, of the fingers? They are the distal end. They are at the end of the finger. Yup. And that assumes that we scan the body from a superior to an inferior orientation. So, I hope your fingernails are at the end of your finger. If not, then you've got an interesting anatomy. Now, why is this tricky. Well, you might say, I get that. It's not that hard. But what about this? The fingernails are distal to the head. True or false? What if you said, if you say that, you're saying the fingernails are at the end of the head. Are your fingernails at the end of your head? They're not even up there. So, how would you describe the fingernails with respect to the head? They're not proximal. They're not distal, because they're not part of the head. So, the only way to describe the fingernails, with respect to the head, would be to say that they are what? Inferior. So, my point is, sometimes these words don't even apply. They don't fit. Sorry to miss your question.

[Inaudible student question]

>> Well, not really. Because, are the fingernails a part of the wrist? No, they're not a part of the wrist. They're a part finger, right? So, they form the distal end of the finger, but they're not distal to the wrist. What are they, with respect to the wrist? They're inferior. So, there you see, it gets a bit tricky. But these words apply mainly to things that have a definite beginning and a definite end. So, let's say, well, let's talk about the anus. You know with the anus? Is that the proximal or distal end of the digestive tract? It better be distal, unless you're putting food in the wrong place. All right. So, the anus is indeed distal to the digestive tract. What forms the proximal end? The mouth. So, distal and proximal are usually are referenced again to something that has a definite beginning and something that has a definite end. Are we good? All right, good. Next, medial and lateral. Medial has a kind of automatic reference, because it reminds you of middle, doesn't it? And middle means, well,

in the center. So, medial is a word that applies to anything that's toward the imaginary midline of the body, or a body part. So, certainly the nose, your nose, is certainly at the center line of your body. Lateral means at the side. Espanol, it's called lateRAL. But it's still what? At the side. Back to this. The fingernails are blank to the spinal column. Using one of these two. They better be lateral. Again, it might deviate, but most everybody I see, the fingernails are lateral to the spinal column. Once again, assuming what posture? Standard anatomical position. Great. Now, another, and final, set of words that are opposites. Superficial or deep. Almost self-explanatory. Superficial means at the surface. Visible without doing any digging. And deep means, well, not superficial. In other words, underground. So, you can say these tiles on the floor are, s-word. Superficial. And any pipes or wiring that might be invisible would be, then, deep. How about your fingernails? Are they superficial or deep? I hope they're superficial. Otherwise, you're painting something else. So, they are found superficially. At least in most people. So, these are words that I think are easy to adopt. They might be tricky in a few instances, but overall, not too bad. Next, regions or surfaces. Regions pertaining to body areas that you might have different words for. I think you all know what the groin means. That's a street word for you-know-where. But, we call it the inguine, also known as the inguinal area. So, inguinal and groin would be synonymous. That place where you put deodorant? I guess you might put it anywhere. But most people put it in what they call their armpit, but no. No. No. We call it the axilla. The adjective here is axillary. So, axilla is the noun. Axillary is the adjective. Then we have plantar, which is a word that, right off the bat, doesn't have any immediate suggestion. But it refers to the foot. What part of the foot, what part - I'll start again. What part of the foot do you plant on ground? Well, the sole, and hence the name, plantar surface. So, as you leave a footprint, you are basically printing the plantar surface of your foot. What do you call that part that you can look down and see? That's called the dorsal part, or dorsum. And that word not only applies to the foot, but what you might describe as the back of your hand. But we don't call it the back of your hand. We call it the dorsum. So, this is what? The dorsum. What might be a great name for this part? It's up there. It's palmar. Which is the anterior surface of the hand. And that word makes perfect sense, and hardly requires any real difficulty to memorize. But do start to use those words. Bring them into your vocabulary. Because we'll expect you to adopt, understand, and phrase things anatomically correct. Good to go? Question? Say again?

[Inaudible student question]

>> The name for the top of the foot is the dorsum, also known as the dorsal surface. Dorsum is the noun. And dorsal is the adjective. So, you would say the dorsal surface. So, just to repeat, this part of your hand is what? Palmar. This part is the? Dorsum. Or, you could say, the dorsal surface. Good. Sections or planes? The body, or any part of the body, can be sliced in three, very distinct geometric slicings. Three geometric planes. And they're illustrated in this illustration. One, two and three. Before we go further, is this guy positioned

correctly? That is, how would you grade or rate his anatomical position? Is it SAP? He could do a better job there. He needs a little practice, but not too bad. Whoever he is, he needs to be faceless. But oh no, it's me. How could I screw up? You can do a better job. But let's go on. Sagittal. Now, there's a word that's tricky to spell, because it's got two Ts. It comes from Greek, meaning an arrow. Something very straight. But, for our purposes, sagittal means any kind of lengthwise cut. A longitudinal cut, that then divides whatever we have left into two sides, left and right. And, incidentally, is left and right an acceptable reference? Of course. But, what would you call this hand over here? That's not the right hand. This is the person's what? Left hand. Over here's the? Right hand. So, when you use left and right, it's always not with your reference, but the individual's reference. Left and right parts. Now, sagittal can be either on center or off center. When it's on center, it's called what? Mid. And the definition of that would be dividing the specimen into, into equal, equal. What, left and right parts. Which of these, which of these plans appears to be mid-sagittal? Is it one, two, or three? It's one. This is mid-sagittal. And this one, which is labeled sagittal, is also further what? Appears to be, anyway? Mid-sagittal. Anything that's not mid-sagittal, anything that's off-center, is called parasagittal. Para meaning near. But, in this case, not very. So anything that's off-center, and divides the specimen into unequal left and right sides would be parasagittal. Good to go? then we have transverse, which is also known, incidentally, as horizontal. Because, basically, the knife or cutting instrument would be moving in a horizontal plane with reference to the imaginary ground. So, transverse is a horizontal cut which divides the specimen into what? Superior and inferior part. Which of these, then – which of these numbered planes would be transverse? Two. And this could be done at any level. It could be done from all the way in the head or neck region, all the way down to the feet. Transverse. And finally, the third possible plane is what's called the frontal plane. Which also goes by the name coronal. Now, the word coronal is a little, a little odd, because literally the word coronal means crown. Just like a crown that might be worn by some royalty, right? Crown, sitting up here? So, if that were to fall, it would cut the body in this way. Indeed, a longitudinal cut, but the resulting parts would not be left and right, they would be anterior and posterior. So, guess which of these three, then, would be the coronal section? Number three. Once again, that can be done at any level, from anterior to posterior. Here's yet another view of these ideas. And so, each of these cuts that I'm showing here, each of these are horizontal, so they would be what? Transverse. This one here, which divides the specimen into anterior and posterior parts, that would be frontal. And, if you don't like frontal, you can use what? If you don't like coronal, you can use frontal. We're good with either one of those. Sagittal, remember, can be either on the midline, or away from the midline. Let's look at some examples. An actual cut through a human body. And, at first it might be a little disorienting. Don't look right there. But, anyway, which one is this? Is it sagittal, transverse, or frontal? It's transverse. And in case you're totally disoriented, this is the heart, and these are the lungs, and this is the spinal cord. These images can be literal,

or they can be digital. Certainly you're familiar with imaging techniques like MRIs and CT scans. So, those take actual slices of the body, and this would be, then, as you see, a transverse section. Let's go to another one. This one may be hard at first, but let's get oriented. These are the bones that make up your back, right? A V-word. What's that? Vertebrae. And are the vertebrae on the midline, or away from the midline? So, with that said, what kind of section has been done here? It's longitudinal, all right. It's sagittal, all right. But which of these two? Mid-sagittal. How do we know it's mid? Well, if it wasn't mid, then we wouldn't see these bones. What are these bones? The vertebrae. In fact, here's another sagittal view. There's the heart, and there's the lungs. What's missing back here, what's missing are what? The vertebrae. So is this sagittal? Yes. But, it's not mid-sagittal. It must be parasagittal. Good. So, let's go back, just to make that clear. Here is sagittal. What kind of sagittal? Mid. And then, if we get away from the midline, then that we be parasagittal. Here's one which is a no-brainer. That's a pun. In case you didn't recognize it, this is the mouth, and that's the brain. So, what kind of section down there? Coronal. Alternative name? Frontal. So, this is just that. And, you might say, what are the advantages? Well, any given section might have an advantage, because it would show something a different way, or show something that otherwise couldn't even be seen with another kind of section. So, these are all equally meritorious. That is, there's a time and place for any of these. And, incidentally, these can be done on any organ. Can we cut a heart frontally? Can we cut a heart sagittally? Yes. So, it doesn't just apply to the body, but rather to any part of the body as well. Good to go? All right. Final topic, then, for today. Internal cavities of the body. Oh, here's some opportunity for a little comic relief. Come on in. Have you met Russell and Bill, our what? One point five children? Okay. What kind of a section has been done on Bill? Yes, sagittal. But what kind? How do you know it's mid? Four point five. If it was one point four, it would be parasagittal, right? All right. I miss Gary Larson. He's retired, but he was a great humorist. All right. Back to internal cavities. You're quite aware that the body is not just a, a bag of organs, but rather, organs that are a part of, and divisible into, various internal cavities. And the functions of these cavities of, well, quite numerous, actually. First and obviously, they protect the organs that they surround. Physically protect, from trauma or assault. But they also, what's the word here? Restrict. That means, prevents these organs from moving. Do we want the stomach to move into the chest? I don't think so. So, restricting the movement is a secondary function. A tertiary function of these cavities, also, then, is that it tends to isolate infection, that is, prevents the spread of infection. But that's more of a third or fourth-order function. Primarily, cavities protect and make optimum the function of those organs. For instance, you know where the lungs are. Would they work good in the cranium? No. So, you get my point. So, let's slice the body, as shown here. And, before moving, is this transverse, or horizontal, or coronal, or sagittal? Sagittal. What kind of sagittal? Mid-sagittal. This section, revealing things from a more anterior perspective, that must be what? That's a frontal, also known as a? Coronal. Uh-oh. But, no head there. What will we do

about that? All right. There we go. I had to change that. I actually liked the one that was there for eight years previous, but all right. That's a political comment. I didn't actually say that. All right. Next, let's go on to parts of the body. That is, cavities inside. And, certainly from the superior-most perspective, we have one that you know and love, called the cranial cavity. The word cranial is an adjective, therefore it has to be followed by the word cavity. But, is there a single word that could take the place of these two? Cranium. Yeah. Cranium is the noun. Cranial is the adjective. Either way, it's the space that creates a cavity for what? What visceral structure resides in the cranial cavity? Brain. I hope yours is there. And so, yeah. The cranial cavity is the space created by the many bones of the skull that surround the brain. And do what? Again, the function of any cavity is to, p-word? What? And to? Restrict. You want your brain to leave the cranial cavity? No. That would be most unwelcome, although possible. Next, the spinal cavity, which is implied here. And certainly you're aware that it's a space generated by the stacking of many bones. Bones, you know, are vertebrae. So, it's a space created internally, through the stacking of these vertebrae, forming the vertebral column. What visceral structure occupies the spinal cavity? Spinal cord. Spinal cord is part of the central nervous system, obviously connected to and a slave to the brain. So, the spinal cavity, understood to be midline, and actually connected to and continuous with the cranial cavity. Moving inferiorly, we have a space that a lot of people, they call their chest. But no, no, no. We don't call it the chest. We call it what? Thoracic cavity. The word thoracic is an adjective, therefore followed by the word what? Cavity. Is there a single word that can take the place of those two? Thorax. You bet. So, thorax is simply the space created by the ribcage, and to some extent also by the vertebral column. It's superior to a piece of soft tissue seen here and known to most of you, correctly, as the diaphragm. The diaphragm is a muscle, involved in breathing, you know. But it provides this inferior border to the thoracic cavity. So, in short, everything that's superior to the diaphragm is part of the thoracic cavity. At least those segments that are defined by the ribs. Now, this cavity is very big, obviously. And just like your house – is your house one room, or many? I'm guessing many. And so, this cavity is partitioned. That means divided, into, well, subsections. Which are actually delineated by two very distinct serous membranes. We'll talk about membranes in general. But serous membranes, not serious. What? Serous. The word means watery, or filmy. These membranes are wet, W-E-T. And we find serous membranes wherever we are trying to minimize the F word. Friction. And so, serous membranes are typically found around organs that are moving. And are there organs in the thoracic cavity which move? All the time. Lungs are moving. The heart is moving. And by moving, I don't mean, you know, jumping out of your chest. But, nevertheless, contracting or changing shape. So, these serous membranes are distinct, based on what they surround. And the first two are called the pleural sacs. Also simply known as pleura. These surround and house the lungs. Once again, these are serous membranes, so what is their implied function, if they are wet? To reduce the F-word, what? Friction. And that means to prevent the development of heat and irritation

which might otherwise result. Is the heart in motion? Does it deserve some sort of friction reducing mechanism? And the name of that membrane is easy. It's called the what? Pericardium. Also known as the pericardial sac. And this prevents friction which would otherwise develop around the heart, which could be irritating to its performance. So, in summary, the thoracic cavity is divided into the pleural spaces and the pericardial space. The pericardial sac houses and surrounds the heart, and the pleura surround the lungs. Thus, the thoracic cavity is visible, then, by these two, very distinct, serous membranes. Moving inferior to the diaphragm is the most spacious cavity, called collectively the abdominal-pelvic cavity. Some people say stomach, but stomach is not a cavity. Stomach is an organ. Is the stomach in this cavity? Yes. So, the abdominal-pelvic cavity is the space inferior to the diaphragm, but superior to the urinary bladder, which is not shown here, but you could draw a bubble there and be pretty much right on. I think everybody knows their urinary bladder is just about right there. Anyway, anything superior to the urinary bladder, but inferior to the diaphragm, would be the abdominal cavity. And that is lined and defined by another serous membrane. Because think about it. Are there organs in the abdominal cavity that are moving? 24-7. Yeah. Does the intestine move or contract all the time? So, the name of this membrane that lines and defines this cavity is the peritoneal sac, also known as the peritoneum. Again, it's there for what reason? What's the function of any serous membrane? Yep, it reduces friction. And also, incidentally, tends to enclose and isolate, and therefore somewhat physically defend against infection. That said, can any of these spaces, any of these membranes, become infected? Of course. Now, what would you call an infection of the peritoneal sac? And if you know it, it's called simply peritonitis. Peritonitis, the result of a stab wound, or maybe a ruptured appendix. And is peritonitis dangerous, even lethal? So, of course, these membranes isolate, that is, protect from the spread of infection in that regard. Inferior to the abdominal portion of the abdominopelvic cavity is the true pelvic cavity. Again, pelvic is an adjective. What's the single word for these two? Pelvis. Which means basin. And here you have the bladder, the urinary bladder, of course. And also the lower organs of the GI tract. That is, the more distal segments. The large intestine. And some, but not all, of the reproductive organs. And so, that's the visceral content thereof. We said early on that cavities tend to restrict the movement. We implied that was a good thing. Where's the stomach physically? Which of these cavities is the stomach in? And, can the stomach move vertically through the diaphragm and actually poke into the thoracic cavity? Is that something you would welcome? Your stomach in your thoracic cavity? Now, there's a word for that. Hidden right up in here. No, that's not it at all. There is it. The word is hernia. And we've heard that word, but a hernia means the movement of an organ away from its logical or normal location. What's the normal location of the stomach? What cavity? Can it move up into the thoracic cavity? Yep. Is that a good thing? No. What's it called? It's called a, here it is, a hiatal hernia. Much more commonly, at least in men, you can have a piece of intestine that moves out, out of the abdominal cavity into the scrotum. Does that sound like a good

thing? No. Not good. Very painful. Potentially problematic. And that's called a hernia, too. But what kind of a hernia? That's called an inguinal hernia. So, these things can happen. Here's a CT scan of an infant. And, naturally this is the brain. And it shouldn't be out here, should it? What do you call that? What hernia, what organ has herniated there? The brain has herniated. Usually that's lethal, right on the spot. But it can occur. Also survivable is this kind of hernia. Some of you know this. What organ has left its natural position or cavity here? Spinal cord. And many of you know the name of that. It's called spina bifida. Which may, or may not, be lethal. But certainly going to produce problems, in terms of sensory and motor performance below the level. This can usually be treated surgically, which applies to all hernias. Can hernias be fixed? Yeah. But not at home. That is, you just can't, you know, have somebody shove something back for you, and expect it to last. And, sadly, this is a photo of a baby that was, of course, born deceased. Many of the organs have herniated here, and that's intolerable. So, in short, are these cavities useful? Yes. Because they what? They protect, and they physically restrict the movement, and therefore optimize the performance of these organs. So, I hope that was helpful, and useful. And sorry I went over. We won't do that again. We had to do it, because of the introduction today. Have a great day. See you here, when? Wednesday, at 12:30. Uh, we'll use it later. So, it's not something you'll need for awhile, but I'm glad you bought it.