>> Professor Steve Langjahr: Professor Steve Langjahr: It's March 1st already, 2017. This is a lecture that obviously fits nicely, after we've considered the skeleton. One of the functions of the skeleton was to allow for movement. And that is made possible by, of course, this system called the articular system. Essentially, an articulation is a joint. Not the kind that's been legalized by California. But rather something that at least permits movement. But technically, a joint doesn't have to move at all. So, for us, the definition will be any point of contact between bones, regardless of whether there's flexibility or not. Now, there's lots of ways to approach this subject. Lots of ways to classify joints. Two that I can think of, right off the bat. We could classify joints by their structure, what they're made of. And so, that would be based on the material that actually forms the joint. The other approach would be based on the function or the degree of movement. So, these ideas are not that foreign. And indeed, they could be represented as an analogy. If I say a brickhouse, is that a functional or a structural reference? If I say a sorority house, well, that's a functional. Actually, your textbook takes a totally different approach. It decides to organize joints based on region. So, it will deal with regions of joints, shoulder, elbow, etcetera. So, there is no one system that's best. But for better or worse, we're going to do the functional classification. We're going to base our look at three ranges of motion. And right off the bat, you can imagine there could only be three. There are those joints that don't move at all. There are those joints that move very easily and freely. And then there are those joints that are sort of in between. So, at least for me, that system makes some sense and we'll take that approach. So, how many categories?

>> Three.

>> Professor Steve Langjahr: How many functional categories? Three. The first we're going to call in immovable. That is, those that don't move or move very little. And the word for this category is a synarthrosis, arthoses is plural. The prefix syn, we'll use a lot. It means to connect, to unify, to join together. So, synarthroses, also known as synarthrotic joints. In this category, there are two subcategories. And the first of those is the least moveable of the least moveable. And those are called synostoses. What about os? Does that have any kind of ring to it? Bone. So, if you really analyze this word, it's saying basically a bone to bone fusion, complete fusion. And the obvious example that comes to mind are those you've already seen in lab. Especially in the cranium. And so, a good example here, cranial sutures. Are you born with cranial sutures? No. You know your cranial bones are quite slippery, meaning they are pliable. They are able to move. There's a connection there called a fontanel, which eventually disappears. And then the bones become completely interlocked. Another example of a synostosis is actually any bone that's been repaired after a fracture. And so, if you've ever fractured a bone, you now have a new joint there. It's called a synostosis. And you'd want it to be immovable. You'd want it to be strong and sturdy, just like the cranial sutures are. Second category, still within this immovable group. These are called synchondroses. What's chondro seem to suggest? Chondro, cartilage. And syn means to unify

or bring together. So, if you analyze the word and you always should. I mean, never memorize a word that is meaningless. Look for the meaning. And there's quite a bit of information, in this case. Synchondroses, are those are essentially bridged or joined by cartilage. What kind of cartilage?

>> Hyaline.

>> Professor Steve Langjahr: Hyaline cartilage. Any one example come to mind? Well, you've looked at our articular skeletons. And you know that ribs are joined. Some of the ribs are joined to the sternum. And so, that's a good example. You might say well, that's fairly flexible. Well, it's a matter of argument there. We're going to classify them as pretty much, pretty much immovable. And so, this is the second of two subtypes for this big category of synarthroses. Good to go? How many categories?

>> Three.

>> Professor Steve Langjahr: Three. So, here we are on to number two. Number two is halfway between those that are not movable and those that are freely movable. And so, the word that's used is amphi, amphiarthroses. Because in Latin, the word amphi means between. The idea here is that these joints are between those that are immovable and those that are freely moveable. Amphiarthrosis then, slightly moveable. Here too, we're going to have categories underneath this, subcategories. And there are two subcategories of these amphiarthrotic joints. The first are called symphyses. And you may know one, based on your lab experience so far. For instance, here's the pelvic girdle. And these bones out front are the pubic bones, right? Are they bone to bone or is there something in between? It's cartilage. It's in fact, a disc of fibrocartilage. So, this is a good example of a symphysis. In fact, this is called the pubic symphysis. Which doesn't normally move a lot. But remember, we're talking about a joint which has slight, slight mobility. And has, as you know, probably quite a bit more at the end of pregnancy. Because this tissue softens. And the pelvic bones tend to pull apart a bit, which allows for easier birth. A symphysis. So, we have examples, including the pubic symphysis. But not to forget the vertebrae. What's that tissue between each and every vertebra? It's fibrocartilage. And is that freely moveable or slightly moveable? Slightly. Some might argue with that. They might say, well, I don't know what you're talking about. This is pretty freely moveable. But individually one on one, it's very slight. If you multiply slight by slight, by slight, by slight, you get quite a bit of movement. But individually, between any two vertebrae, then there's not much movement. So, the material that joins or creates the symphysis then, is fibrocartilage. Which not only is sturdy, but it also absorbs a lot of impact, a lot of energy. So, cushioning is an important secondary role of these kinds of joints. Next and finally in this category, syndesmoses. Once again, syn means to unify or connect. Desmo, refers to a strap, s-t-r-a-p. So, the idea here is that bones are held together by some visible connection. Typically, dense, regular connective tissue. And what's the name for any strap made of dense, regular connective tissue? L word.

>> Ligament.

>> Professor Steve Langjahr: A ligament. How's a ligament different from a tendon? Tendons are –

>> Muscles.

>> Professor Steve Langjahr: Muscle to bone. Ligaments are bone to bone. But are they both made of the same stuff?

>> Yes.

>> Professor Steve Langjahr: And what is that stuff? Dense, regular connective tissue. Is it flexible? Mm-hmm. Is it strong? Mm-hmm. Is it elastic? No. And so, ligaments are strong, flexible, but not elastic. What's the protein that makes up dense, regular connective tissue? C word.

>> Collagen.

>> Professor Steve Langjahr: Collagen. And so, ligaments owe their strength to the collagen. Best examples of syndesmoses are found along the bones of the lower leg. As well as the bones of the lower arm or forearm. These in the arm you know are radius and ulna. Below the knee, those are the tibia and fibula. Are they able to move apart? No. What keeps them together is a syndesmosis. So, if you're asked to give an example of a syndesmotic joint, you could say well, along the radius and ulna. And along the tibia and fibula. These are only slightly moveable and so, they belong to our category amphiarthrosis. This just reminds me of how important it is for you to accept and understand the organization. So, if I say, what category do syndesmotic joints belong to? You say they're a part of the slightly moveable or amphiarthrotic category. But of course, the joints we really care about are not those that are slightly moveable, but what? Those that are freely moveable. And so, the third category is just that, those that are freely movable. And these are those that well, are called diarthrotic. The word dia means completely. In this case, completely mobile. There are 96 of these in your body. And you probably never give them a thought until what?

>> They hurt.

>> Professor Steve Langjahr: Until they hurt. In fact, isn't that true about everything in our body? We don't care about anything until it starts to give us trouble. And then we suddenly pay attention. So, joints do give us trouble. And all of us will have joint issues sooner or later. Some sooner, especially if you abuse the joints. But we'll get to that topic later. So, for now, let's describe a generic diarthrotic joint. What are the generally features of any diarthrotic joint? As we'll see, these joints can also be called synovial joints. Because they contain a common feature, which is the synovial compartment, a synovial membrane. So, we're going to diagram, very crudely, a sort of standard or typical diarthrotic joint. And we've got you started here. This could be the knee. It could be, for instance, the hip. But what are the general components?

First of all, the bones that are involved are surrounded by an envelope. A water proof capsule, which is called the fibrous capsule. This is pretty strong and pretty tough. It's made of dense, irregular connective tissue. And deep to the fibrous capsule, is a membrane which is very fragile and very thin. Practically inseparable from the fibrous capsule. And the name of that membrane is the synovial membrane. Sometimes just called the synovial space or synovial cavity. And it's called that because it produces a fluid. Guess the name of that fluid.

>> Synovial fluid.

>> Professor Steve Langjahr: Synovial fluid. Synovial refers to its property, very slippery. And synovial fluid is, of course, water based. But it contains a great many soluble proteins, which make it very viscus. There's a word, viscus. Viscus means thick or sticky. So, if I throw water at the wall, will it run right off? So, water is not very, V word?

>> Viscus.

>> Professor Steve Langjahr: Viscus. But if I throw egg whites at the wall, it will stick and sort of run down. So, egg white more, V word?

>> Viscus.

>> Professor Steve Langjahr: Viscus. Why do we want this fluid to be sticky? We want it so stick to the surfaces because implicit in its function is what? Why would we need a fluid here at all? To reduce, F word?

>> Friction.

>> Professor Steve Langjahr: Friction. So, the L word, that would be lubricate. And indeed, synovial fluid is one of the slipperiest compounds you'll ever see. If you've had physics, there's an actual number given to calculate the slipperiness of stuff. And it's called the coefficient of friction. This is off topic. But synovial fluid shares the same coefficient of friction than ice on ice. Can you imagine that? Ice on ice. If you have an ice cube, will it just sort of glide across? Okay, so, muy slippery, very slippery, synovial membrane. It owes that slipperiness, not to the water, but to the soluble proteins that they're in. In lab, you're going to get a chance to actually handle synovial fluid because we'll bring in some fresh joints. And if you reach into a joint and grab that synovial fluid, then as you put it between your fingers, you'll find that it's very snotty. I hate to use that word, but you know what I mean. It's very elastic. V word again, very?

>> Viscus.

>> Professor Steve Langjahr: Viscus. Its function then is not just to lubricate, but also provides nutrients to the surfaces that it does lubricate. And those surfaces are seen here in blue. Surfaces that actually make contact in the joint. And those are called the articular surfaces, also called articular cartilage. So, it's time that we catch up with our discussion, by finishing this diagram. Here's two bones. And here now in blue, will show that the surfaces that are actually

touching, are covered with a thin layer of articular cartilage. And what's the histology of that cartilage? What kind of cartilage is it? H word.

>> Hyaline.

>> Professor Steve Langjahr: Hyaline cartilage. Now, why is that a perfect choice? A perfect kind of cartilage? Hyaline cartilage is very, s-m-o-o-t-h and also very slick. So, the function of this cartilage is also to minimize friction. However, it's very thin. And so, even though, we'll get to it in a moment, can this cartilage be damaged, as a result of trauma or even disease? So, the articular cartilage, as any cartilage, is avascular. Therefore, when it is injured, it's going to be difficult to heal or repair. Okay, so, this surface in blue is the articular cartilage. And then surrounding the joint, indeed enclosing it into a waterproof sort of capsule, was this outer membrane called the fibrous capsule. I did mine in green. And then deep to that, lining the fibrous capsule, we'll use a different color to show the membrane, which actually produces the fluid we're speaking of. And so, in pink, that would be the synovial membrane. Okay, so, I lost you. The blue is what?

>> Articular cartilage.

>> Professor Steve Langjahr: Articular cartilage. Green?

>> Fibrous capsule.

>> Professor Steve Langjahr: Fibrous capsule red or pink is the synovial membrane. And the synovial fluid, obviously fills the interior of this space. Providing nutrients to the cartilage and also reducing friction, lubricating the joint. So, the articular cartilage, is actually the material which is sustaining much of the friction. And bearing a lot of weight, especially in the lower extremities. The function of the articular cartilage is to create a smooth, durable surface. Which basically, minimizes friction. It doesn't provide much cushioning. I want to stress that. Why can't this cartilage cushion much? Well, the answer lies in this word right here, t-h-i-n. It's much too thin to cushion. And so, in those joints, which are sustaining a lot of compression, those joints that are bearing a lot of weight. There may be additional cartilage, which is sandwiched in between the articular surfaces. And that's true, especially for the knee. And in those locations, we call that cartilage a meniscus. Meniscus is singular, so what's the plural word? Menisci. If you've heard that word at all, you might have heard it in chemistry. It pertains to that dimple of fluid that's often seen at the column, the top of a column of water. It actually refers to something that's concave because the meniscus is biconcave. That means it's hallowed out on the top and bottom. Often also, described as a semilunar disc. What's lunar mean? Lunar actually refers to the moon. Semilunar means half a moon. So, a meniscus, seen from above, will be shaped like the letter C, semilunar. What's the material? What's the material that menisci are made of? Fibrocartilage, which is much better suited for what? [pounds on desk]. Compression and shock absorption. Not surprisingly, you find menisci in the knee. And surprisingly, not any other place, except the jaw and between the clavicle and the manubrium.

Those are the only three locations where diarthrotic joints have menisci. Can this cartilage be injured? Yes. Any cartilage can be injured. But meniscal tears are common, especially in athletes. So, the function of the meniscus is to provide shock absorption. It also contains sensory nerves, which give you the impression of weight bearing or joint movement. So, these provide for sensory reception. You have this diagram there, which is actually a sagittal section through the knee. And so, what is number three, you think? Number three is the meniscus. And the surface, which is the articular cartilage is there, shown as number two. But you don't have to be that artistic. We want you to be diagrammatic. And so, this is good enough. So, what's the orange? Meniscus. What's it made of? Fibrocartilage. What's its physical properties? Well, its physical properties is the R word, it's, resilient. And its function is for shock absorption. And therefore, cushioning, you could argue. It provides cushioning. It also provides joint stability. That is, it prevents the joint from wandering. And so, injury to the menisci can be painful. It can also bring into contact the articular surfaces, which is not a good thing. And it can also lead to some degree of joint instability. Anybody had a meniscus injury? Hey, good, join the club, me too. And let me just sort of guess. Probably sports related?

>> No, just lifting patients.

>> Professor Steve Langjahr: Just what?

>> Lifting patients.

>> Professor Steve Langjahr: Lifting patients. Well, that's a sport in itself. Mine was nothing that I can, you know, I could say it was a skiing accident, but I'd be lying. But you will find people that have had meniscal tears. And the problem is, you can't fix a meniscus because really, it's very, very difficult for it to heal on its own. And that's because it's cartilage and all cartilage is a?

>> Vascular.

>> Professor Steve Langjahr: Vascular. The best you can do with a meniscus, when it's injured, is take it out or at least take out part of it. What did you have done?

>> I did physical therapy, but it still bothers me.

>> Professor Steve Langjahr: Oh, okay. She had physical therapy, but it still bothers her. So, I can set you up with a surgeon and he can take care of that for you. We have a lot more to say. Indeed, you're going to put your hands on a meniscus because in lab, you're going to see one up close and personal. Moving on, none of these things that we've mentioned so far, really keep the joint connected. Because all of these things are not that strong. Even the fibrous capsule is not that durable. So, what holds two bones together in a very strong and firm way? These are called L word?

>> Ligaments.

>> Professor Steve Langjahr: Ligaments. Made as you know of dense, regular connective tissue. These basically connect bone to bone. And as such, they provide the kind of strength that prevents a dislocation. So, diagrammatically and very crudely, we'll sketch some black connections there. And those will represent the L word what? And these are called capsular or collateral ligaments because they are. They are collateral. Typically, medial and lateral and sometimes even within the joints. Some of you may know already of the anterior cruciate ligament, posterior cruciate ligament and so forth. So, ligaments are basically bone to bone straps made of dense, regular connective tissue. Once again, the strength there is due to what protein? What protein makes dense, regular connective tissue so strong? C word.

>> Collagen.

>> Professor Steve Langjahr: Collagen. Now, also found, but not always, around many diarthrotic joints, are those features called bursae. Bursae is plural, bursa is singular. The bursae in Latin means a purse, p-u-r-s-e. In other words, a sack. And these are said to be extra articular. What's that mean, extra articular? It means, outside the joint. So, legally, technically, the bursae are not part of the joint. They are pads of fluid, which are often found between surfaces that are moving in opposite directions. And so, they provide a kind of pad or cushion for improving the gliding of muscle on bone or a tendon on bone. And if you've heard this word and I know you have. It's not in a good context. What's the reference that comes to mind? What's the condition that comes to mind when you hear the word bursa? Bursitis, which is a kind of joint disease. Although, actually, technically, it's a not a joint disease because these are not part of the joint. The function of these then to reduce friction between moving surfaces outside the joint. Now, we said these joints are moveable and certainly they are. But what causes them to move is nothing we've mentioned so far. What causes any joint to move is not any of this, but rather the M word here, muscles. What kind of muscles? Obviously, skeletal muscles. Skeletal muscles attach to the skeleton by way of dense, regular connective tissue. But these are not ligaments, these are tendons. And the strength and the health and the integrity of these, is the most important factor. The most important margin of safety against joint injury. What am I saying? If you have a joint injury, it's probably not due to any of this stuff. But rather, you have weak what? Weak muscles and tendons. Which allow for injury to be often generated. Simple example, you've never been skiing and someone takes you to Mammoth and you're up there on the black diamond. Good luck. You're going to come down the mountain with some joint injury. And it's not because your joints were unhealthy, it's because your muscles were just not up to that kind of brutality, as you go down those moguls or whatever. So, to protect your joints, the best advice is to build up your what? Your skeletal muscles, whatever they might be in a particular area. Ninety-six or so of these joints. And I'm always amazed at what people can do with their joints. Some people make a living out of dislocating and relocating their joints. And so much so that there's this catch phrase, which is completely false. You've heard it. People like this must be

what?

>> Double jointed.

>> Professor Steve Langjahr: Double?

>> Jointed.

>> Professor Steve Langjahr: Jointed. There is no such thing. They simply have ligaments, which are much more slack. And therefore, permit more movement than say you and I. And that's great if you want to be a circus performer. Let's move on to what? Types of diarthrotic joints because there are a lot. And luckily, these are fairly descriptive, almost intuitive. In other words, the name brings to mind their morphology. To be sure, all of these that we're about to mention are diarthrotic. That means, they're freely what? Freely moveable, but there are degrees of freely moveable. And so, certainly there are those that are more moveable than others. And the words that we're about to use then, often relate to geometry or structural analogies. And here's a classic, ball and what?

>> Socket.

>> Professor Steve Langjahr: Now, what does that seem to mean? A ball and a?

>> Socket.

>> Professor Steve Langjahr: A socket. So, I'll hold this up. And some people say, oh, it's a doorknob. No, it's not. What is this?

>> A trailer hitch.

>> Professor Steve Langjahr: This is a trailer hitch. And what goes on top of that? Right. So, this is the B word.

>> Ball.

>> Professor Steve Langjahr: And this the?

>> Socket.

>> Professor Steve Langjahr: Socket, all right. Is that a pretty freely moveable thing? It's designed to be. Where on the body do you know there exists ball and sockets?

>> Shoulder.

>> Professor Steve Langjahr: Shoulder and hips. They are very movable. They are feely moveable. And in fact, they should display three axes of motion, three axes of movement. And that's called tri what?

>> Axial.

>> Professor Steve Langjahr: Axial. Luckily, mine still work. So, and I've been practicing, so I'm anxious to perform. I'll use this one here, it's handy. And so, I'm supposed to demonstrate what, not one, not two, but?

>> Three.

>> Professor Steve Langjahr: So, this is one axis, right? It's fun. And this another axis, right? What's the third axis? Right. So, one, two, what?

>> Three.

>> Professor Steve Langjahr: Three. Name of that is?

>> Triaxial.

>> Professor Steve Langjahr: Triaxial. Certainly, represented in the hip and at the shoulder. Next, we have a joint, a diarthrotic joint called a hinge joint. Obviously, named after what? Let's guess.

>> A hinge.

>> Professor Steve Langjahr: A hinge. So, I brought one in, it's a hinge. Is that freely moveable? Sure. But does it move in all conceivable axes? It moves real nice this way, but it will not move at all that way or certainly not that way, either. So, it's not tri, but it's uniaxial. Where are some good, logical hinge joints? Well, let's reveal, elbow. Now, some argue or debate that. They say, oh, yeah, I get this, but I can do this, too. Well, if you turn your hand, that's not the elbow at all. So, if you can do more than this with your elbow, I want to see it. Because we want to get it up on, you know, Instagram and you know and put you on the news or something. But basically, this is it. Then there's the second example here, interphalangeal, which doesn't have to be scary. Inter means between. Phalangeal means phalanges. So, that means between your what? That means that joint there and that joint there. That joint there, that joint there. Not this one down here because these are the metacarpals. So, just those distal two, you can do that and that's it, right? Word for that is the U word, what?

>> Uniaxial.

>> Professor Steve Langjahr: Uniaxial. If you can do something else, let me know. Some say, well, I can do this [brief laughter]. Well, that's not that joint! So, okay, let's be honest. Uni what?

>> Axial.

>> Professor Steve Langjahr: Axial, a hinge joint. A pivot joint, the word is now not structural, but with reference to the kind of movement, it suggests pivoting. These are also uniaxial. Meaning, one axis. And the best example you know and have seen already in the lab, is the atlas, which turns on the axis, C1 and C2. And so, that is rotation, as a word, as a concept. And so, they're called pivot. Usually allowing just uniaxial movement. Number four, a kind of joint called gliding. Sometimes also called planar. Gliding is a reference to what you see. And planar is a reference to the flat nature of these joints, usually. Uniaxial, but in many directions. That's kind of a conflict, it sounds. Basically, these bones are often very close together and very tightly fitted. Just

like my hands brought together here. And they can move only in one axis. But they can move in many directions. They can do this, this or this.

>> I was just asking because our lecture notes say triaxial.

>> Professor Steve Langjahr: Your lecture notes are outdated.

>> Okay.

>> Professor Steve Langjahr: Sorry. I guess I didn't get around to fixing those. My bad, I'm sorry. So, these are going to be what?

>> Uniaxial.

>> Professor Steve Langjahr: Uniaxial, but in many directions. So, once again, hands together, right? So, what can happen here, we can go forward and back. We can go side to side or we can even turn. But it's very limited movement. So, very tiny movements, but on one plane, one plane. And the best example here are those that are basically found within your wrist. You know those bones are called the carpels. And then down in your feet, the same bones are called the tarsals. They are freely moveable, but they don't move much. And the joints there are basically then gliding or planar. Next, condyloid. Condyloid refers to a condyle, which means a smooth, usually convex surface. These are biaxial. That is, they permit side to side and back and forth, but no R word, what? No rotation. Best example here are the metacarpophalangeal or the metatarsophalangeal. And I know that's a terrifying and very long word, but let's not panic. Where are the metacarpals? Right here. Where are the phalanges? Right here. So, in short, we're talking about your knuckles, okay? Does that reduce it enough? So, I'm talking about this joint here. So, is this joint capable of that?

>> Yeah.

>> Professor Steve Langjahr: Yeah. Can we do that, as well?

>> Yes.

>> Professor Steve Langjahr: Can we do that, even? But that's not rotation. Some people call that rotation. But the bones are not actually turning, they're just sort of arching. So, back and forth, what? Side to side, but no what? Rotation. So, if you only have two axes, what's the word? It's right there, the B word?

>> Biaxial.

>> Professor Steve Langjahr: Biaxial. So, someone says, what's your knuckles? You say they are condyloid, belonging to the category of diarthrotic. And they're capable of biaxial motion. Be sure that you take the time to understand, to justify, the classification of these. A saddle joint. Pretty limited. That is, a biaxial joint, which basically is seen between the first metacarpal against its carpal. And that naturally means the thumb, that is right here. This joint is a

saddle joint. So, let's walk through some of these again. The knee, what would that be? Certainly, a diarthrotic, but what kind of diarthrotic?

>> Hinge.

>> Professor Steve Langjahr: Hinge, okay, great. Capable of trauma and injury, of course. What about the shoulder?

>> Ball and socket.

>> Professor Steve Langjahr: Ball and socket. What category?

>> Diarthrotic.

>> Professor Steve Langjahr: Diarthrotic. What subcategory? Did I already get that? Yeah, ball and socket, I'm sorry. So, the shoulder is a ball and socket, belonging to the?

>> Diarthrotic.

>> Professor Steve Langjahr: Diarthrotic category. And certainly, another example is also the?

>> Hip.

>> Professor Steve Langjahr: Hip. What range of motion is permitted there? Not one, not two, but three. And that's called a triaxial type of joint. The elbow, to repeat, is just a uniaxial. And so, what's the H word?

>> Hinge.

>> Professor Steve Langjahr: Hinge. So, it's a diarthrotic hinge. Where are some other diarthrotic hinges? Are there diarthrotic hinges here? Yes. Are these them? No. Are these them? No. Are these them?

>> Yes.

>> Professor Steve Langjahr: Yes. These are the interphalangeal. This is the metacarpophalangeal. This is actually a condyloid. So, these are gliding. These are condyloid. These are, H word?

>> Hinge.

>> Professor Steve Langjahr: Gliding condyloid hinge. And of course, that same thing is found in the feet. Remember, another name for gliding is planar. And there are other examples. So, let's move on and finish up with some disorders of joints. Which is really an application of the basic anatomy. Certainly, the big offending here is the A word, that's what?

>> Arthritis.

>> Professor Steve Langjahr: Arthritis. Which literally means inflammation of joint. Most often diarthrotic joints. There are at least a half a dozen different kinds of arthritis, three that you need to know. Because these are the most common and therefore, the most important. First on this list OA. OA stands

for osteoarthritis. Another synonym for that is degenerative arthritis, which I actually like because at least you're learning something there. It's arthritis, which is due to degernation of something. Basically, this is the wear and tear arthritis. And as such, it is promoted or brought on by what? Joint abuse or what?

>> Obesity.

>> Professor Steve Langjahr: Which is the same thing. And then brought on by what? Old age. So, you can prevent this by dying young and never getting fat [brief laughter]. So, great, go for it.

[Inaudible Question]

A popular wives tale or a husband's tale or a myth, actually. Cracking your knuckles does create an interesting and fun sound, but it doesn't cause arthritis, sorry. So, crack all you want. We'll have more to say on that later. Degenerative arthritis then, is often associated, not with youth, but with older folks. Keep in mind, it is arthritis. And what does i-t-i-s always mean? Inflammation. So, the joint is inflamed and is certainly therefore painful. And can lead to actually injury. I should say further injury. It's often caused by injury. And in the end, it leads to breakdown of the articular cartilage. What is the articular cartilage made of?

>> Hyaline.

>> Professor Steve Langjahr: Hyaline. Is it thin or thick?

>> Thin.

>> Professor Steve Langjahr: Is it easily damaged? What can damage it? Joint abuse, obesity and simply wear and tear over time. Here are two heads of two different femurs. This is how hyaline cartilage should look like. This is OA. What's OA? Osteoarthritis. Can you fix that? Not very well. Can you deal with it with pain medicines and so forth? Yeah, but ultimately what's going to be in your future, if you are suffering from OA? You're going to have some surgery. And so, better get some insurance going because it's going to be costly. This is the surface of the head of the femur. It looks like the landscape of the moon. This is healthy hyaline cartilage. This is not. Of course, that cartilage can be sort of sculptured with various tools, including the arthroscope. But ultimately, and many of you know folks that have had a total knee, a total hip removal, right? We'll show you these prosthetic things. And they are in fact very wonderful. Because people who have OA are not walking well. And are thankful for any improvement in their mobility. Next, RA. RA stands for rheumatoid arthritis. This is not so much a wear and tear, it's actually a condition. That is, not a contagious condition, but it is a pathological condition. Actually, an autoimmune disease. Meaning, your immune system produces antibodies against your own tissue. So, it's kind of self-destructive, self-inflicted. It starts as a thickening of the synovial membrane. Which over time causes a remodeling of the joint, breakdown of cartilage. And certainly, leads obviously, to deformities

of the joint. A lot stiffness. A lot of swelling. And a lot of p-a-i-n. Here are two hands. Guess which one is a victim of – oh, it's already there. Right here, rheumatoid arthritis. Probably could have guessed that without the label there, right? And here's how it looks, as you may see it in patients. What appendages are effected? Well, any joint, but especially obvious and crippling in the fingers. How do you treat this? Well, remember, it is an i-t-i-s. What's that?

>> Inflammation.

>> Professor Steve Langjahr: Inflammation. So, ibuprofen and other anti-inflammatories are the main state. Does this cure it? No. There is no cure for rheumatoid arthritis. Next, we have gouty arthritis, which is often simply called gout. This is actually a metabolic problem, which is well known and actually treatable. You could say even curable. Very common in males. Essentially, it leads to high levels of uric acid in the blood. And then uric acid tends to crystalize in the synovial fluid. Now, that doesn't sound good, right? Would you want crystals in your synovial fluid? That would be like throwing sand into your motor oil and hoping it would work. So, it's very gritty and painful. And for reasons that aren't quite clear, it tends to affect the extremities. But especially and mainly the big toe. In fact, it is so painful that people with gout in this area, often say cut that thing off please. I'd just rather not deal with it anymore. But you can deal with it because it can be treated with medicines that obviously reduce what? What's the culprit? What's the cause here? So, well, yes, yes, but the real problem is the build-up or uric acid. So, medicines that block the formation of uric acid, are wonderful and useful in gouty arthritis. Finishing up, bursitis, we mentioned it. It's obviously what it sounds like, inflammation of the bursae. This is not technically arthritis. But it is promoted or hastened by prolonged pressure or stress on a joint. So, this tends to affect athletes or people who do repetitive things. A version of this is called tennis elbow. Another version is called carpet layers' knee. Obviously, carpet layer knee is caused by people who lay?

>> Carpet.

>> Professor Steve Langjahr: Carpet. And they're on their knees all day, right? So, bursitis has nothing to do with the joint, but the bursae, which surround the joint. It does cause a lot of pain and discomfort and therefore, immobility. But it too can be treated with anti-inflammatory things such as ibuprofen and so on. And then finally, a sprain, not to be confused with a similar sounding word, strain. It's not a strain, it's a what?

>> Sprain.

>> Professor Steve Langjahr: Sprain. Everybody's heard the term sprained ankle, sprained wrist, whatever. But a sprain involves some injury, not to the bones, but to the ligaments that hold the bones together. And when the ligaments are stretched or torn, those bones have greater mobility. Sprains come in three degrees. First degree, second degree and what? Third degree. Third degree is when the ligament is torn all together. And that will cause bones to

move radically and usually get your attention. Stretched ligaments, first degree, are often amenable to conservative treatment. That means, cold compresses and again, ibuprofen. But speaking of the knee, is that subject to sprains? Yes. And so, the collateral ligaments and the cruciate ligaments are often implicated in a sprain. In short, a sprain usually leads to dislocation or can lead to dislocation of a joint. The problem with a sprain, especially if it's a third-degree sprain, is that you've done what to the ligaments? Torn them. Now, are those ligaments just going to come back together and say, let's heal? No. They're not going to happen. So, this requires surgical intervention. Because ligaments just don't spontaneously fix themselves. And so, surgery is necessary in the case of a third-degree sprain. So, let's be easy on our joints. And well, exercise them, but, you know, don't go overboard. Have a great weekend. We'll see you on Monday.

>> You didn't mention the second degree of the sprain, right?

>> Professor Steve Langjahr: Well, it's – I know. It just means one that's stretched more than a first degree.

>> Oh, okay. Thank you.