>> All right everyone, so as you already know, we discussed epithelium in lecture on Thursday and, or actually in lab last week. So today we're going to pick up where we left off with discussing our core tissue types and start today with connective tissue. So I want you to notice something. What I have done here is, in parentheses, very often, when we discuss connective tissue or have to write anything about connective tissue, as you know, I've been saying to you in a test situation that I would very much appreciate and you will get full credit if you write the full complete name of the tissue. And, so our connective tissues, so for example we have areolar connective. And I said to you, you don't have to write that world tissue and on our test, on all of our tests, we don't want to abbreviate anything because we are graded, in part, on our spelling. I am going to tell you though, throughout this semester, exceptions that you can make to that. And, one of the exceptions that you can make to that is anytime you're talking about any sort of connective tissue, if you, instead of writing, for instance, areolar connective, if you write areolar ct, I'll know that you meant connective tissue and I'll assume that you know how to spell connective. So it's okay if you want to write out connective, that's okay with me too. But, if you're talking about a connective tissue, it's absolutely okay to use that abbreviation ct in your discussion when you write it. So having said that, let's now say, when we looked at epithelium, we looked at five types of epithelium, even though the cell shapes were different, I would say or I would hope that, after having looked at those tissues for a few days, that when you see epithelium it's pretty, you're pretty good with epithelium. It's like you look at it, you say, okay I know that's some kind of epithelium. The cells are closely packed, even though they're different shapes. They're an outside edge. And, so I'm pretty confident, I'm speaking for you. I know you are confident in identifying epithelium. With connective tissue, what we seen in lab is that there is a lot of diaper city. There isn't any one kind of look to connective tissue in terms of how much connective tissue we have in our body. It is everywhere. So it's the most abundant tissue that we have in our body. And, when we look at it under the microscope, they don't look the same. So they're all connective tissues but there is a lot of variation. So with that said, here are the primary basic components of every connective tissue. In any connective tissue we're going to have these three, and I'll say in most connective tissues, we're going to have these three components. We're going to have some sort of cell, because of the tissue. And, the definition of a tissue is the same type of cell, an intercellular material with the same function. So it's going to have some sort of cell. Here's what I want you to know through the rest of the semester. When we see these suffixes either blast or site, which we've discussed already, or phage, when I see that a the back of any word, I'm looking at a cell. I'm talking about a cell. So start to recognize these suffixes that, if I see that in a word, I'm talking about a cell. Almost all, this is where we'll say almost all. Almost all connective tissues have protein fibers. We have a couple of connective tissues that are what we all non fibrous and we'll point those out as we go. And, all connective tissues has something called Ground Substance. So as we move through these connective tissues, we will identify the specific type of cell for the tissue with each particular tissue

type. Every tissue type has a different name of a cell. Oh we're going to start our discussion with protein fibers and ground substance because that's basically the same in all connective tissues. So when we're talking about protein fibers, why are they there? Why do connective tissues have protein fibers? They're to help strengthen the tissue and give it structural support. And this next statement, if you have your highlighter ready, please highlight the word arrangement, which you can see I have also italicized. And, so what we're saying about the fibers is that what kind of fibers we're going to see. We're going to define three different types of protein fibers. So the type of protein fiber the connective tissue has, how many of that fiber the tissue has, and, this is so important, the arrangement of the fibers. Meaning how do the fibers sit one to the other? The arrangement will vary, the type, the abundance of the arrangement is going to vary depending on what is the function of that particular, specific function of that particular connective tissue? So what I have done, in the slideshow is, wherever I'm talking about the arrangement of protein fibers, I'm going to italicize it in the slideshow. So that you'll know, when you see these italics in this particular discussion, that is giving me a word or group of words that are telling me what are the arrangement of the protein fibers. So please highlight that. So here they are. We have three basic types of protein fibers. We've discussed them in lab, now let's define them. So a connective tissue might have collagen fibers. Collagen fibers, if we were to describe the structure of a collagen fiber, right, we're, the structure, we're picturing, were picturing what this would look like. Collagen fibers are long and straight, they're flexible, meaning they can bend and then go back to their original shape and, but they're stretch resistant. In other words, that is inelastic. Meaning, if I pull on them, if I try to stretch them, they are not going to stretch. So they're flexible but inelastic. So out of the three fibers we're going to see collagen fibers most often. And, they are the strongest of the three types of the protein fibers. Elastins, with an N not with a C, it's not elastic, it's elastin. So how would I describe the structure? Different. Right? Not long and straight like collagen fibers, but branched. So they look like a tree branch or a split end on your hair, right, branched and very, very thin, thus the word threadlike. They are also flexible, they can bend and go back to their original shape. But, they're also stretchy, that is elastic. So when we pull on them and lengthen them, when we let go, they go back to their original shape. And, the last type of protein fibers are call reticular fibers. They're very short. They're interwoven, another word might be mesh like or net like in how they're arranged with each other. And, that is just of the point of them they're going to form a mesh like or net like framework for certain organs in our body. Where are these protein fibers come from? Where are, where did they come from? They're made by the cell. So the cell of the particular connective tissue produces the fibers, secretes it around itself. That's where the fibers are coming from. The ground substance is where we're going to find the cells and the protein fibers within. So the ground substance, in other words say that is surrounding the cells and the protein fibers of the connective tissue. The, an very important word here, is grand substance is nonliving. That is it's noncellular. It is, anywhere in terms of its consistency, it might be fluid to

viscus to solid. So I know what fluid means, I know what solid means. Viscus means thick like a glue or a paste. So that is the word viscus. So the grand substance can be any of these types of physical characteristics and anything in between. And again, where's the grand substance coming from? It's produce by the cells. So the cells are making the protein fibers and secreting them around themselves. The cells are producing the grand substance and secreting it around itself. So it's not living, it's noncellular. What is it made of? Here's some chemicals, right, the chemical makeup of grand substance. We're going to see this all semester. We should just get used to it now. When we're talking about pretty much, not every, pretty much any material that's outside of the cell, it's going to be made primarily of protein, carbohydrate, and water. And, so these are the three primary chemicals. Are there others? Yes. The three primary chemicals that make up the ground substance. And, so depending on the amounts of each of these is what will determine if it's fluid or viscus or solid. More water, more fluid, more protein, more solid, more carbohydrate, a little bit viscus. Right? So that's what we're talking about. This word matrix is the term that we use for the ground substance plus the protein fibers that surround cells and connective tissues. So right, we have the cells, they're surrounding by the ground substance and the protein fibers. And the ground substance and the protein fibers together is called matrix, the matrix of a connective tissue. So here are our connective tissues. We have one group of connective tissues that are called loose connective tissues. So the loose connective tissues include areolar connective. All right. Now, here's what we're going to start to also highlight. When we're seeing cell names, I'm going to put that in red font. And, so red font is going to tell me cell names. There are, they're called fibroblasts or fibrocytes. So let's determine what makes, what is the difference between a blast cell and a cyte cell? A blast is a producer of matrix. So these, these particular cells are making matrix, so thus in nice big bold font, fibroblasts produce. And, now what are we seeing? The again, italics. This is telling me how are the fibers arranged. So I have both collagen and elastin fibers, fibers are in blue, so both collagen and elastin, and they're scattered. And, that means they have no particular arrangement one to the other. And, the ground substance is semi-liquid, thus loos connective tissue. Fibrocytes are also present in areolar connective. So I have fibroblasts and fibrocytes, fibrocytes are going to be mature cells that are no longer producing matrix. But, they're maintaining the health of the tissue. They're doing all of those jobs that cells do to maintain the integrity of the tissue. Homeostasis, and repair, etcetera, etcetera, etcetera, etcetera, metabolism. There are some other cell types in areolar connective tissue. Macrophages, there is that suffix phage. Macrophages are found in areolar connective. And anything that's a phage, any phage cell is an engulfer. That is, it will encircle and engulf items that are found in the tissue. In this case it's going to engulf cell debris. So as the tissue is, becomes worn out, it will engulf worn out cells and break them down and recycle them. The other thing, the other cell I haven't listed here but what you've seen in lab, the other cell found in areolar connectives are called mast, M A S T, mast cells. We're going to talk about mast cells down the road. Mast cells are part of our group of cells

that are part of our immune response. So we will discuss those later. What else do we need to know about areolar tissues? Where's it found? What is it, what is its main jobs. So areolar connective tissue attaches the skin to the underlying muscle. That's one of its main jobs. It's also a location, right, in between the skin an muscle. It fills spaces between organs as kind of a filler. So that's both a job and a location. And, areoler connective surrounds and supports our blood vessels, again a job and a location for areolar connective. We've seen it, we know it, we love it. This is areolar connective tissues. So we're seeing the fibrocytes or fibroblasts, impossible to tell which is which here. That's okay. The thicker fibers are collagen. The thin threadlike fibers, dark fibers are elastin. And, in amongst, this is not space, this is the loose water like liquid ground substance. Another loose connective tissue is adipose connective. And, now we have a new cell type that we need to know. So the cells in adipose connective are called adipocytes. And, so they're actually a fibroblast that's filled with lipid. And, so when a fibroblast becomes filled with lipid, they are called adipocytes. This is one of my two non fibrous connective tissues. So we aren't going to find protein fibers of any sort. There's no collagen or elastin or reticular fibers. And, the ground substance very similar to what we saw in areolar connective, that is water, protein, carbohydrates, semi-liquid. What is the, what are the main functions, jobs of adipose connective? Any place I have lipid stored, I'm storing energy. Lipid is an energy molecule. So wherever I have this lipid in, on my body, it is there for energy storage. But, also lipid, adipose connective, as it surrounds viscera, acts as a cushioning for viscera to help protect it from blows. A good example of cushioning viscera would be a layer of fat around the kidney, called the peri means surrounding, perirenal, renal means kidney, perirenal fat. And, it's a layer of fat surrounding the kidney because the kidneys are very near the posterior abdominal wall and not completely prtoect by our ribs. And, so this layer of fat that helps to cushion the kidneys, looks like this, looks like big old fat marshmallows, um, um, yes, filled with lipid, very close together, no fibers. There are no fibers out in the ground substance. And, if we're getting, going to see any organelles it would be as we see with this arrow here the nucleus, all of the organelles are pushed up against the inside of the cell membrane here. All right, last, loose connective tissue is called reticular connective. And, so this has come up in lab the last couple days. This idea of okay, Professor Fikert, I don't see reticular connective in the lab book. And, it's not. But we're talking about it here now in lecture. So what do we need to know? We need to know that we will not see every single item, we'll see most of them, but every single item we discuss in lecture, we might not see in lab. And, so if it's not in the lab book, I don't need to know it for lab. But, if we're talking about it in lecture, I do need to know it. So reticular connective, my cell types again are fibroblasts immature, fibrocytes would be mature, and macrophages again. And, now the fiber type, reticular fibers, that's the name. And, so reticular fibers, those protein fibers, again, we've mentioned already. What is the, how are they arranged? They're mesh like or net like, that is they interlock with each other. And, this particular connective tissue forms the internal framework in solid organs like the liver, the spleen, lymph nodes. So

what we're going to see, as we progress through this lecture, many of our organs are hollow. But, those organs that are solid, many of them are going to be composed, in great part, by reticular connective tissue. Looks like this. So here are those interlocking mesh like net like reticular fibers. And, then these are the nuclei of the fibrocytes, the fibroblasts. We have a couple of connective tissues that are called dense connective tissues. And, the first is called dense regular connective tissue. I'll define what that means in just a moment. The good news is, we don't have any new cells yet. So we have fibroblasts again, which we've seen now a couple of times, that produce the fibers in the ground substance. In the case of dense regular connective tissue, the protein fibers are collagen fibers. And, the reason that this tissue is called regular, please, please make a little side note about this because we're going to talk about it all semester. And, I'll mention it many times. You're going to say is she going to tell us this one more time? Yeah. Yeah I probably will. So this is how important it is. Regular means the arrangement of the collagen fibers. So they're in a regular parallel bundle. So the collagen fibers are all bundled together in a very regular, parallel, dense, meaning they're very close to each other, arrangement. The ground substance is what we call viscus, it's kind of a gluey pasty kind of ground substance. Those, remember fibroblasts, I will just mention this one more time, when we use the word blast it's talking about a producing cell. We will also see fibrocytes in this tissue, they will be the mature maintaining the health of the tissue cell. So what is dense regular connective tissue doing? What's its job? Structural support. So let's talk about where it can be found and talk about what that word, those words structural support means. Dense regular connective tissue makes up our tendons and ligaments. So when we're looking at that, a tendon is a structure made of dense regular connective tissue that attaches muscle to bone. A ligament is a structure made of dense regular connective tissue that attaches bone to bone. So what does that mean? Structural support. It allows for the muscle attachment, which is going over a joint, ligament attachments which pass over a joint to give support to the structure of the joint. That's what structural support means. The other place we see dense regular connective tissue are in the outside coverings called capsules of, again, certain types of joints called synovial joints. So we're going to encounter dense regular connective tissue again when we talk about synovial joints. Just for now, a side note, the synovial joints, they're of course different categories of joints of course they are, but different categories of joints, synovial joints are freely movable. So those are the joints we usually think about when we think about a joint or an articulation, those that have free movement. So they are surrounded by an outside capsule of covering composed of dense regular connective tissue that helps to give the joint structural support. This is what it looks like. So here's some fibroblast here, right, here's a fibroblast here, here's a fibroblast here. And, here are the thick parallel bundled collagen fibers. Dense regular, the fibers are all running in the same direction, connective tissue. This is another connective tissues, along with our next, dense irregular connective tissue, that, this is a very good question that came up in lab yesterday. I think, it was, I think Amere was asking this yesterday, correct me if I'm wrong. But, these are, these are not

found in your lab book. Are we going to talk about them all semester? Yes we are. We're going to find them a lot. But, you will not have to identify these tissues in lab. So dense irregular as opposed to dense regular. Again, fibroblasts are going to produce, again, collagen fibers. But now, instead of them being long parallel bundle in a very regular pattern, they are interlocking with each other. So it doesn't, the fibers don't have a regular pattern and they don't line a particular way, they actually interlock with each other, still very thick because collagen fibers are always thick. The ground substance is what we call viscus. So a little bit different job, because what did we say? We said that the type and abundance and arrangement of the fibers in a connective tissue help to define its function. So if I have a different arrangement of collagen fibers, dense irregular connective tissue's going to have a different job than dense regular connective tissue. So I'm, they're going to provide, dense irregular connective tissue's going to provide strength and structural support, but in a very specific type of a place. So not connecting like a, like a ligament, a bone to a bone, not just connecting. But, these are areas that are going to get some amount of stress from many different directions. So let me give you a couple of examples where we would find these. Around the outside covering cartilage which we have looked at in lab. We said that both, when we're looking at hyaline cartilage connective and elastic cartilage connective, they both have an outside cover called a perichondrium. And those areas of cartilage are getting kind of pushed and pulled from different directions. And, so that outside covering cartilage is made of dense irregular connective tissue. Bones have an outside covering and it's called a peri, there it is again, surrounding, periosteum surrounding the bone. So perichondrium cartilage, periosteum surrounds our bones. And, so it's the same dense irregular connective tissue. And, there are several functions of the periosteum. But, one of them is that's where tendons and ligaments attach. Tendons and ligaments can't attach directly into bone, it's too hard. So it attaches into this covering of dense irregular connective tissues. So then when those, when those muscles pull in different directions, bones have muscles attached to them in different directions, there's no damage and there's structural support for the attachment of the tendons and ligaments. The other place we will see dense irregular connective tissue are surrounding any organs. So on the internal viscera there might be an.

[Audio interruption]

Thank you. So the outside covering of organs would be, they're called fibrous capsules. Both dense regular and dense irregular connective tissue are also called fibrous connective tissue. So the outside covering of organs are call fibrous capsules and most of the time those are going to be, or every time that's going to be a dense irregular connective tissue. The other place we're going to see dense regular connective tissue, very soon, is in our next lecture on Thursday. Because the thickest layer, the skin, the dermis is composed of dense regular connective tissue. So we'll revisit it again, but that also makes sense, we have a lot of pull and push and stress on our skin. And, we don't want our skin to tear. And, so it can take all of that stress from many different directions. So let's look at this.

We're not seeing those parallel collagen fibers. See they're all interlocking, very irregular. Here are the nuclei of the fibrocytes and the fibroblasts and these interlocking collagen fibers, dense irregular connective tissue. So important connective tissues, let's start with the cartilages. So in cartilage, we've talked about this, every time you're asked about cells of the cartilage, is going to start with condro, chondro means cartilage. So the chondroblasts are the producers. Cartilage enters the ground substance is always going to dense meaning thick, it's going to be firm, it is somewhat hard. But, it is going to have some flexibility, so a little bit of bend. That's the ground substance. Again, the mature cells in cartilage are called chondrocytes. We're not going to see a lot of blood vessels in cartilage. It's that word avascular which we've defined already. And, because of that, as always, if we have a tissue that is avascular or epithelium, epithelium are another example, then the nutrients and waste products are going to get to the cells by way of diffusion. But, that also means, in terms of cartilage, not so with epithelium because epithelium has all of the layers that are being replenished from the basement membrane. But, in cartilage, because it's avascular, if there is any sort of damage, it takes a long time and very poorly allows for growth and repair in adults. So that's why we see things like, if someone has a, many of you have probably experienced this or know someone that's experienced it, had some sort of a tear in something like the meniscus of the knee that, which is a fibrocartilage pad, it may never repair because it is poorly vascularized to the outside edge. The inside edge is vascular, the outside edge is not. And, that's where the tear usually occurs. So we have three types of cartilage that we've seen in lab, hyaline cartilage connective, we're back, right, let's name the fibers, collagen fibers. And what are their arrangement? Again, closely packed and parallel. So closely packed and parallel, what that means then is that we can't really see the fibers under the microscope, but when we look at the tissue macroscopically, it looks very smooth and shiny. And, the job of hyaline cartilage connective is to give support with flexibility because it will bend and it provides smooth sliding surfaces. So where do we see hyaline connective tissue? Places like the ends of long bones where we want a nice smooth surface every time we move that joint. So hyaline cartilage connective versus elastic cartilage connective. And so now elastin fibers thus the word elastic cartilage connective. What do the fibers look like? They're not closely packed and parallel. They are short and web like. And, they are always those dark hairlike thin hairline fibers. So what do elastin fibers bring to cartilage? They make it firm again, right, fairly solid, but elastic. Right? We can stretch those and they'll bend back and retain their shape. So we talked about this in lab. Where do we find elastic cartilage connective? One of the places in our lab that it tells us is our outer ear. So if we push down on our outer ear and let go, it has that elastic property and goes back to its original shape. Our last cartilage fiber, cartilage connective, back to collagen fibers. And, these are bundle again, but they're wavy. So we see the collagen fibers forming what look like a wave through the ground substance. And, think about this, wavy. So think about something like a spring. A spring is wavy. And, the reason a spring can compress and then bounce back is because of the arrangement of the spring. The same is true of

collagen bundles. They are wavy. And, so these, this particular type of cartilage is going to allow for what's called compression or shock absorption. So it can press down and it's going to take a lot of the shock out of areas in the body, in between bones that there is a lot of compression. So in between the vertebrae and the knee, and in the folder where I can see these paths of fibrocartilage connective. What are we wanting to remember on all of these? We're going to talk about them all semester. What are the fiber types? How are they arranged to each other? And, what are the jobs of each of these tissues including the cartilages? So we've seen this, hyaline cartilage connective. We talked about the perichondrium just a moment ago, here's that dense irregular with an I, connective tissue covering. And, then my fibrocytes that are spread out maybe in groups of two or three or four kind of grouped together. But, that matrix that is the ground substance of the collagen fibers in between the cells provide lots of space. So I don't have tightly packed cells. I have cells that are pretty spread out from each other. Elastic cartilage connective, same kind of look with the chondrocytes but big difference. Dark, hairlike, branched that again is like a split end on a hair, elastin fibers that give the tissue elasticity. And again, the outside covering called the perichondrium, dense irregular connective tissue. Fibrocartilage, still chondrocytes but smaller, small cells with groups again, two, maybe three in a row. But here the collagen fibers, waves, looking like waves. So this can take compression and act as a shock absorber. Another sort of connective tissue is bone. So from here through the rest of our discussion, just as we talked about in lab, we won't spend as much time as we will down the road. Because we're going to try bone and blood and muscle and nervous tissue and each of the systems that they're going to be found. And, then we'll spend a whole lot of time on all of them. But, for our first exam on Tuesday, these are the different information we need to know, basically the same kind of information we were talking about on the tissues that came before. New cell name, new cell name, osteo, whenever for the rest forever more or at least till the end of this semester. Whenever I see this root word osteo, it means bone. So osteoblasts are the producers. What are my proteins? This is a connective tissue. So there are going to be protein fibers. And, in bone they are collagen fibers. How are they arranged? Concentric rings. Concentric rings is that look that we've seen in lab looks like a tree trunk. That's a concentric ring of collagen fibers. But plus, in bone, we're going to throw in some other non organic materials. We're going to put in some inorganic salts of calcium phosphorus. So in our osteo matrix, we have our collagen fibers, we have our ground substance of water, protein carbohydrates, plus calcium phosphorus and organic salts. The mature cells are called osteocytes. And, here's what this matrix in the arrangement of concentric rings, the collagen fibers plus inorganic salts does for both. It makes them very strong. And, it makes it flexible. I want you to think about this for a minute. Collagen, one of the characteristics of collagen are that it can, collagen fibers bend and don't break. So bone, we don't usually think of bone as being flexible. But, it has some flexibility to it. If it didn't have some flexibility, every time we'd step down hard off of a big curve our bone would break, or our bone would break. So it allows, it does have a little bit of bend. It also makes it

shatter resistant. Now not shatterproof. Right? If you take a leap off the top of your roof into your pool and miss, please don't try this at home kids, you're going to shatter some bone. But for the, but it's shatter resistant. And, those physical strong, flexible, shatter resistant physical characteristics allow bone to provide structural support, protection from internal viscera, and leverage, that is attachment for muscles and allowing our muscles to contract and shorten. Bone is living. We, look at a bone and it looks just inert, it looks like there's nothing happening there. But, there are a lot of cells. It is greatly supplied by blood and a nervous system. We've seen it, we know it, we love it. The blood vessels and the nerves enter through the haversian canal and then penetrate through all these little tracks called canaliculi. Because the blood supply has to get to the cells which are in, the osteocytes which are in these paces called the acumen. The matrix, what is its arrangement? Concentric circles. What is the matrix made of? Ground substance, collagen fibers, plus calcium and phosphorus salts. This again is compact bone connective. We're going to talk about a different type of bone next week which is called cancellous. And, it would not be in the same arrangement. Our next two connective tissues are a specialized fluid connective tissues. So the first is blood. Blood fluid connective tissue and it's our second non fibrous connective tissue. No protein fibers, no elastin, no collagen fibers in this particular type of tissue. Hold on a second, Aden's asking me. Do osteocytes carve out and shape the bone? What, osteoblasts. So osteoblasts along with another cell type that haven't talked about yet, Aden, which we will talk about when we, when we talk about bone starting next week. The cells you're thinking about are called osteo, with a C, osteoclast. And osteoclast are the shapers, the reshapers of bone. And, then along with osteo, with a B, blasts, the osteoclast reshape them and osteoblasts lay down new bone. Good question. And, we'll talk about it in more detail next week. So non fibrous, no fibers in blood. And, the matrix is a specialized, you know, mostly water fluid that does have protein contained in it but not in a fiber form, and that's called plasma. And, within the plasma, the matrix of blood, we're going to find what's called formed elements. Please know this term, formed elements. Those are the cells, which we will define in great detail when we talk about blood, but also some fragments of cells. That is it used to be a cell and then the cell broke apart. So we're going to call cells plus fragments of cells formed elements. The other fluid connective tissue is called myeloid. This is marrow red bone marrow. And, this is the tissue that produces red and white blood cells. Myeloid connective produces red and white blood cells. So we've seen blood in lab, we've seen ah the red blood cell, few and far between the white blood cells. And, in between it looks like pink space, but it's actually the plasma, the matrix. And, this is a photograph of myeloid tissue that would be found in the ends of long bones, as one example. So what are some of the functions of connective tissue? It provides physical protection for internal viscera. It gives structural support for things like joints, and it cushions internal viscera, something like adipose connective tissue. Different connective tissue connect and bind, for instance our dense regular connective tissues connects and binds muscles to bone and bone to bone. Fat storage in the adipose connective. Mineral storage is going to be

bone connective. Transporting nutrients and gases would be blood connective. And producing blood cells is myeloid connective tissue. Muscle tissue, we have three types. Again we're going to go way into detail on all of these when we talk about each of these systems. For now, let's say this. Muscle tissue, all muscle tissue, all muscle fibers are contractile, that is they shorten to move. They're very closely packed to each other. And again, the word for cells here is fibers. So not the same thing as the protein fibers. This is a word that means cell when we talk about muscle tissue and nervous tissue. So how are muscle tissues going to be classified? According to either where they're located in the body or what do they look like under the microscope. So skeletal muscle's named according to where it's located, attached to the skeleton. Oops sorry. And, here are some words we would used to describe it. Voluntary, I have conscious control over the contraction of skeletal muscle. The fibers are, you've seen this already, striated, they're long, they're parallel, they're multi nucleated. Cardiac muscle is found only in the heart, named for its location. Cardiac muscle is involuntary. I don't have much, a little bit maybe, much conscious control over the contraction. But they are also striated. The fibers are branched, not long and parallel, and they're mono-nucleated. And, smooth muscles surround my viscera, also involuntary, no striations. The shape of the cell is spindle, in fact a little point at both ends, and again mono-nucleated. So they look like this. We've seen cell to muscle, long, parallel, striated, multi-nucleated. Versus cardiac, branched, shorter, still striated, mono-nucleated. Smooth muscle, no striations, spindle shape, mono-nucleated. So the functions very general, we'll talk about it in more detail. In order, skeletal muscle provides motility that is movement and structural support. Cardiac muscle pumps blood. And, smooth muscle provides the squeezing action to move materials through tubes in our body. And, lastly, nervous tissue, also called neural tissue. Specialized to conduct electrical signals for communication throughout the body. So there are two types of cells, neurons or nerve cells or never fibers are the electrical impulse generators. Neurons are the communicators of the nervous system. Neurons are surrounded by a another group of cells called neuroglia or glial cells or glial tissue. And, the neuroglia surrounds, support, protect, provide a framework for the neurons. So they are not electrical generating, they are structural support insulators for the neurons. So we've seen neurons in lab as well. This is a cell body called a soma, central nucleus, these processes called dendrites and a single usually process called an axon. All of this material that we're seeing surrounding, that neuroglia, insulating, supporting, the very delicate and oh so important neurons. Okay. We'll, we don't need, nobody in this class except me need to worry about that. So we are going to finish here. And, I will finish our recording so that it.