LORNA GIBSON: So I think one of the special things about this course and about my kind of research on cellular materials is that I spend a fair amount of time talking about materials in nature. So I talk about wood, for instance, and what it is about the cellular structure that gives rise to the density dependence of wood properties and the anisotropy in wood properties. I talk about trabecular bone, and I talk about the structure and properties of the bone, but also we do a little bit of modeling on how you might look at bone loss and osteoporosis. So if you lose a certain fraction of the bone density, what residual strength would you expect the bone to have.

We have a project on bamboo right now. We talk about the structure of bamboo. Bamboo is actually a grass. And this is a Chinese species of bamboo called moso bamboo, and you can see how big this one is. They even get bigger, maybe six or eight inches across.

And what we're interested in doing is making something called structural bamboo products. And this is an example of a bamboo oriented strand board. So the same way people take wood, and they chop wood up into strands and make oriented strand boards for housing construction, you could, in principal, do the same thing with bamboo.

And we have a project that's in collaboration with some colleagues at the University of British Columbia. They're the ones who are actually making the bamboo oriented strand board. And with some architects in England, in Cambridge, England, we're looking at things like how you might modify wood building codes that talk about wood structural products, how you would modify that for bamboo structural products. And what we're doing here at MIT is we're looking at the structure of the bamboo and doing some modeling of the mechanical properties of the bamboo itself. So that's one example.

Here's another example. This is a bamboo laminate. So this is a little bit like a glue laminated wood member, but in fact, this one is made out of bamboo instead of out of wood. So it's the same kind of idea. Let's see. We've also had a project in the past on cork.

So this is a cork from a wine bottle, and we've looked at that. Cork has an unusual mechanical property. You know, if you take a rubber band and you pull on it, if you can make it longer this way, it gets narrower that way. Well, if you load cork in one direction, if you, say, pull on it or compress it, it doesn't get any wider or narrower in the other direction. It just stays the same kind of size.

And you can show that that's related to the structure of the cells. The cells are like little bellows, or like a little concertina. So you can imagine if you have a little concertina, and you push on it this way, it doesn't really get any bigger that way or smaller that way. It just stays the same dimension. And the cork cells look a little bit like that, and that's why they do that.

So we have all these natural materials. We talk a little about the hierarchical structure in plants. The cell walls are fiber composites, and then there's a cellular structure. And plant materials have a sort of hierarchical structure, with several different levels of hierarchy, and we talk about that in the class as well.

And we talk a little bit about why that makes these materials mechanically efficient and how you might look at designing engineering materials based on that. So there's a little bit of biomimicking in the class as well.