PROFESSOR: Eating is one of the great pleasures and necessities of life. And to enjoy everything from energy bars to apples, we rely on one part of our bodies to do an important job-- our teeth.

[TEETH CHATTERING]

Teeth are the hardest substances in our bodies. They're harder than our bones. And they're even harder than iron or steel. So why doesn't our jaw just crumble under all of those forces? Between your tooth and your jawbone, there is a specialized piece of tissue called the Periodontal Ligament, or PDL for short. The PDL can easily absorb the normal forces that a tooth experiences when we chew, say, an apple, cushioning or protecting our jawbone from our teeth.

Teeth sound like they're already perfectly designed. But sometimes, we really need to force them in a certain direction, like with braces. As the braces slowly force the teeth to move, the PDL is squeezed in one direction and stretched in the other. To make room, the mechanoreceptors in the PDL trigger cells called osteoclasts that actually come in and dissolve part of your jaw to make extra room.

The mechanoreceptors also trigger another kind of cell called an osteoblast, which comes in and builds up part of the jawbone. This allows the PDL to get back into its regular cushioning shape, thus holding the tooth securely in position.

So if braces use osteoblasts to physically reposition teeth for cosmetic reasons, what if we want to use them to replace things in our bodies? Dental implants replace teeth that are damaged or missing to restore chewing function. Your jaw isn't the only place where these osteoblasts and osteoclasts are altering your bone structure. In fact, this bony remodeling process is happening throughout your entire body.

And these implants aren't just limited to teeth. Doctors can replace knees, hips, even spinal discs. And MIT engineers are using the properties of osteoblasts and osteoclasts that are already in our bodies to create a chemical coating for these implants. Just like in a mouth with braces, this coating helps create natural bone to help lock the implant into place.

Right now, these implants are designed to have the exact same functionality as the parts that they're replacing. But scientists are already developing implants to improve the performance of our bodies and brains. So at that point, would we be more machine than human?