



**Transcript for *Green Machine: The Slightly Gross Truth about Turning Your Food Scraps into Green Energy* by
Rebecca Donnelly (Henry Holt and Company)**

Introduction (approximately 0:00 – 3:59)

Hi everyone! It's Colleen from the KU Natural History Museum, and I'm so excited for Story Book Science today! Now although we are starting, I do want to wait for some more folks to join us. So while we wait, I want to talk about microbes.

Now microbes are these really small, tiny organisms. We can't see them with our naked eye! And there are so many different microbes: bacteria, viruses, fungi. There are so many microbes.

Now sometimes microbes don't get credit for all of the amazing things they do! For instance, did you know that there are microbes in our guts and in our stomach, and those microbes can help us digest our food and make sure we get all the nutrients we need to function? I think that's pretty amazing that there are microbes in my stomach that help make sure that I'm doing my best.

Now, although some microbes are awesome and good, there are some microbes that can really harm us and make us become sick. And you might have heard of a microbe recently that is making people sick: the coronavirus. Now with a microbe like that what we need to do is we need to not only protect ourselves, but we need to protect other people. So doing things like wearing a mask, washing your hands, if you have to cough or sneeze making sure that you cover your mouth. All of those things are important to protect you, as well as to protect other people!

Now we don't want to be afraid of microbes. We know that there are good microbes, and then there are some bad microbes. But we shouldn't be afraid of them because microbes really make our world interesting. And the world would look so different without microbes!

Alright! So it looks like some people have joined us. So let's go ahead and get started!

First and foremost, we're going to go over guidelines for Story Book Science. So what that means is if you want to post a question or write a comment, you are more than welcome to do so! But you need to make sure that you're using kind and considerate words. You also want to make sure that if you respond to a question or a comment, you're also using kind and considerate words. It's really important that we make sure that this space is inclusive and welcoming. So again, use those kind and considerate words.

So welcome to Story Book Science. Today I will be reading the book *Green Machine: The Slightly Gross Truth about Turning Your Food Scraps into Green Energy*. And this book is written by Rebecca Donnelly, and it's illustrated by Christophe Jacques. And we are reading it with permission from Henry Holt and Company. So thank you to them for the permission to read this book! Now I love this book because I think it's really cool to think about how food waste, something like a banana peel, can turn into energy! And we're going to talk about that process. And while we read this book if you have any questions, please feel free to write those! But just know I may not be able to answer them until the end, and only if time remains.

Now the last thing I want to say is if you need a partial transcript of this reading, it will be made available later today on the museum's website. And there is a link to the website page in the video description.

So let's go ahead and get started!

Green Machine. It's just another image of a green machine!

Reading from *Green Machine: The Slightly Gross Truth about Turning Your Food Scraps into Green Energy* (approximately 4:00 – 9:51)

Green Machine: The Slightly Gross Truth about Turning Your Food Scraps into Green Energy includes copyrighted materials, and we do not have permission to include the written text of the book in this transcript.

Conclusion (approximately 9:52 – 16:23)

Alright, and that is the end of *Green Machine*. What a fun book! I, as I've said before, I think it's really cool to think about food waste, something like a banana peel, that can be broken down, and once it's broken down and the products from that process are released, you can then go and turn those products into energy! That's so cool to me.

Now the process that is required for this to happen, you don't just have a banana peel and then there's energy. It has to go through a special process. And what happens is the food waste, and in some cases animal waste, they are broken down by microbes, those tiny, small organisms. And when they're broken down by microbes, they release gas! One gas is especially smelly, it's called methane, but that gas can then be turned into energy. So what happens is it all occurs in an anaerobic digester, and anaerobic means no oxygen. So there is no oxygen in the digester. And the microbes don't mind that because they're anaerobic microbes. And what that means is they don't need oxygen in order to do their work. So they can work in the anaerobic digester breaking down that waste and converting it into energy.

Now microbes, we've talked a little bit about how they're small, they're tiny. We can't see them with the naked eye. And there's so many different microbes: bacteria, viruses, fungi. So it's a very diverse group! But if they're so small, how can scientists study those organisms? Well scientists can use different tools to better understand microbes. One tool they can use is a microscope. So this is a microscope. And what the microscope does is it takes those really small organisms, and then it makes them much bigger. So that the scientists can look at them more closely, and then better understand them. So that's one tool scientists can use.

Another tool is a Winogradsky column. Now a Winogradsky column, that is a combination of mud, dirt, water, and some nutrients. And I have a Winogradsky column that I want to share with you. So let's look at it together!

Now this is the Winogradsky column that I grew using pond water and mud from a pond near my home. And when you look at a Winogradsky column – and I'm going to bring it a little closer to the camera – what you'll notice are these different layers. And they're different colors. Now this is not what the Winogradsky column looked like when I first made it. It looked like this. There were no layers. It was just a mud, and then a little bit of water on the top. But I waited, waited for, like I said 12 weeks, and as the week's progressed, these different layers formed! And those different layers are different microbes. The different colors indicate different microbes that can survive in different types of environments depending on what's present.

So this Winogradsky column. This is the top. As you can see, there's a little plastic at the top. And this environment is full of oxygen at the top. There's a lot of oxygen. It can go through the plastic. You can see that there's green. And so that green, those are plants. And those plants are giving off oxygen. So there's a lot of oxygen at the top. But as we go down, lower and lower and deep and deep into the mud, there's less oxygen. And there's less oxygen. So there are other things in the environment like carbon dioxide, methane, and in some cases, sulfide.

Now when we look at the Winogradsky column, and we think about where the oxygen is present, what we need to do now is determine the types of microbes that live in those environments. So we have a lot of oxygen at the top. Not a lot of oxygen at the bottom. So what type of microbes do you think are present in the bottom layer of the Winogradsky column? Are they aerobic, which means they need oxygen? Or are they anaerobic, which means they do not use oxygen? What do you think?

The microbes at the bottom of the Winogradsky column, those are anaerobic microbes. They don't need a lot of oxygen in order to do their work and survive. So all of these microbes in this layer here, even the purple bits that you might see in the column, those are anaerobic. They don't need oxygen, or if they do, they just need very, very little amounts of oxygen.

So that's how scientists can use a Winogradsky column to better understand microbes.

Now I had a really amazing time talking with you about microbes and food waste and converting food waste into energy, but I do want to let you know it is the end of Story Book Science. I will be back next week, though, with a new book. We will be reading *Redwoods* by Jason Chin, and this book is published by Square Fish, an imprint of Macmillan, who is giving us permission to read it. And I'm so excited to read this book all about the redwood forests and the amazing things that you can learn from those forests. So I hope you join me next week, so we can read *Redwoods* together. I'll see you then! Bye!