>> Chemistry, Diane Jewell: We want to compare fission and fusion. Those are both of our choices in atomic waste and nuclear – I'm sorry – in nuclear energy sources. So, first off, let's take a look at fission. Remember, fission is when we have uranium-238. It's being bombarded by 1 neutron and it releases 3 more neutrons and it also splits up into 2 radioactive elements. Those 3 neutrons then go on to strike 3 more uranium-238s and each of those then split off and form 3 more neutrons. In other words, we have a chain reaction going with fission. With fusion, now fusion has deuterium and tritium, both forms of hydrogen, coming together, hitting each other so strongly that they're actually fusing together and they're releasing some small particles, okay? Both of these, when they collide or when – with this one, when it's bombarded with this one, when they collide together release an incredible amount of energy. And so one of the big advantages of both of these is the intense amount of energy that we get from both fission and fusion. So they both have that advantage. Another advantage of fission with the uranium-238 is it's self-sustaining. You whack it once with a neutron and you just kind of sit back and let it do its thing because it's going to keep on going. As a matter of fact, you don't want to sit back too much because you actually have to control it and keep it kind of turned down a bit because, if you don't control it, will go out of control and we'll have a nuclear explosion. So this is self-sustaining. It doesn't take a lot of energy to get it going and it doesn't take any effort to keep it going, okay? Whereas fusion, you don't see that. It won't keep going unless you keep doing something, so this is an advantage of fission that you don't see in fusion. But let's look at what fusion has. Fusion has an abundant source of fuel. Remember, fusion starts with 2 hydrogens smacking together, tritium and deuterium. Where can you find hydrogen? The biggest thing we have on the planet: the ocean, okay? Ocean H2O, we take our deuterium, our tritium out of there, and we can just keep on going with fusion. You won't find that advantage with fission. And the other advantage for fusion is that the waste products are safer. The wastes that we get from fusion are not as damaging and they're also – they have shorter half-lives. Whenever you have radioactive waste, one thing you have to worry about is, where am I going to keep it until it's no longer radioactive? So you have to make containers. You have to put them in the containers. You have to ship the containers to where you're going to dispose of the containers. Then you have to convince communities that it's going to be safe to put those containers in the ground – it won't bother their water supply, that type of thing. And then you have to worry because these things are going stay there for hundreds of years. How do you know the integrity of the containers are going to be maintained that long? How do you know there's not going to be a leak that will go into the water system? So, you know, things like safety – you have to be careful. So, with fusion, the end products are not as radioactive and they have shorter half-lives. So you don't have to worry so much about the waste from fusion. Now let's take a look at the disadvantages and you'll see they actually kind of go together with the advantages. Disadvantage of fission: There's a limited supply of uranium-238. When we run out, we run outs. It's kind of like coal or the fossil fuels. When they're gone, they're gone. They're not going to resupply

themselves, okay? So whereas this had an abundant source, this one is limited and will run out eventually. So you'll see, we had – this is not a problem here because it's listed as an advantage. Okay, one of the disadvantages of fusion is, how do we get tritium and deuterium to hit together so hard that they actually stay together? You have to use an incredibly high temperature, okay? And once you do it, it's not like it can sustain itself and keep going. It's done, it releases its energy, then you've got to put in another high amount of temperature to make another one happen. Then it's done, then you – see what I'm saying? It's not a chain reaction. This was a chain reaction. Once you do it once, it keeps itself going. This won't keep itself going. You have to keep putting in that energy to keep this going. And so this is – this takes a lot of work. Not only that, but the temperatures are so high they haven't figured out a container yet that they can put the stuff in and get that hot that won't melt, you know? Everything's destroyed so easily that they can't bring the temperature high enough yet to actually make this work. So this is definitely a problem, okay – which we don't have that problem because this one's self-sustaining. Now, another disadvantage with fission is the wastes have long half-lives and they're actually rather harmful wastes. These are the ones you want – you'll worry about if you're burying them in the ground because they're going to be there for a long time. You don't have that problem over here, okay? And then, lastly, think about this. Chain reaction is really good because you don't have to keep putting energy into the system; it takes care of itself. But if you're not careful, that chain reaction can get out of control. Here, it's – if you keep this controlled, you're coming up with a limited amount of energy and it's very safe. If this gets a little bit out of control, you may have so much energy being formed all at once that it gets out of control and you have a nuclear explosion. So that would definitely be a problem. That would not be a problem here because there is no self-sustaining chain reaction here. And so the things that are actually advantages here, sometimes are disadvantages here – and the same with this. So, you know, choose for yourself. What would be a viable future for nuclear power? Fission, which we already have but we do have some problems with it, or fusion, which we're still working out the bugs and – think about it.

>> All done?

>> Yeah. I didn't know if I had to come – I didn't want to say, hey, you know, and then it ends up on the tape.