Interview: Ken Clarke

**Note: this video was edited for length and content.*

Ken Clarke: That kind of is the sound of the bubbles that we are listening for -- sort of.

Jol Thoms: So, what would have been causing these bubbles?

Ken Clarke: Yeah. So, what happens is when you have a dark matter particle or something else come in, it hits a nucleus and that nucleus basically moves. And as that nucleus moves, it deposits energy. And so that energy is enough to actually cause a phase transition -- so to cause it to go from liquid to gas. We are watching it with these cameras. We are also listening to it at the same time, and it turns out that the way the boiling actually happens is different for one of our major backgrounds. So, it sounds different. Even though it looks the same, it actually sounds different. So, we listen to it and we can use the sound to tell these things apart. So that gets rid of one of our backgrounds. There is another one that we cannot get rid of that way. It sounds the same, it looks the same, and so all we do is we predict how many of those events we will get in a year. And if we get that number or less, then we say we did not see anything new. If we get a whole bunch more, we say okay, well, either we got our predictions wrong or there is something going on here that we have not understood so far.

Jol Thoms: The events that we are actually hearing would be from a neutrino?

Ken Clarke: Ah. These events are probably neutrons. So, neutrons cause the exact same signals as dark matter. They cause the nucleus to bounce backwards and we cannot tell them apart. Neutrons are the one we have to predict how many we will get and then see if we get more than that. So, the cross-section is how likely the dark matter is to interact in our detector. If we are correct, then the dark matter is going through us all the time. It is just that it is very, very rare that it interacts, and that's the cross-section. How rare it is the cross-section. How do we know that it is going to interact that way? So, we do not really. We know that it interacts gravitationally because that is how we know it is there, right? We have seen galaxies rotating and we have seen a lot of things that say that it is out there and it has mass, so it has gravity. It is affected by gravity. We think it interacts with a weak interaction, which means that it would interact with this kind of, you know, this kind of style of collision. So, we think that that is how it will happen; we do not actually know. There is a lot of dark matter models that say that it will not do that, that the dark matter is a different kind of particle. I come to these things with some experience and having been doing this for too many years, but I think it will be really interesting for this fresh set of eyes and people that are very talented and good at kind of encapsulating what is going on. We are always surrounded by people who are like us. I mean, that is what happens I think in life in general. And so, it would be very interesting to see something that is not, that's not by people that are the same experiences.