Unit 6: Life on Ice

Jonathan Coddington: Museums are really the archives of scientific knowledge. We think that the future of meeting the needs of 21st century biology will be about frozen tissues—life on ice. The Smithsonian has just built the largest natural history biorepository in the world. Biologists are going to be spending a lot of the next few decades sequencing the genomes of many kinds of life on Earth.

We're in the field, out at Edgewater, Maryland, which is The Smithsonian Environmental Research Center, and we are here to start working out the methods for how you put life on ice. You might ask, "So why do we do this?" Well, as a scientist, the main reason is that I want to understand the history and diversity of life on Earth.

For 300 years, we've been studying the morphology of animals, the behavior of animals, the ecology of animals. What we've discovered in the last 20 is that all of those things leave signals in their genomes. So there are a couple of really hard problems we haven't been able to solve with classical data, and we think that genomic data is the way to solve all those problems.

Dana De Roche: Got him. See, and he's in there. That looks like a *leucauge*. Yeah.

Jonathan Coddington: That's one. We'll be catching spiders live and then plunging them directly into liquid nitrogen which, by the way, is a very fast and painless way to go. It's instantaneous. Ready? So, this is sacrificing the spiders. You hear that?

Dana De Roche: Boiling away!

Jonathan Coddington: Why care about spider genomes? It's two obvious reasons—there's silk and poison. They have some of the most elaborate and precise poisons of any organism on Earth. They're widely used in neurobiology research so that they can see the mechanism of how the poison affects cells, say, in a human body. So we think nature is a library of solutions that are waiting to be discovered.

Amy Driskell: Museums are repositories of all sorts of information that people have used in the past and haven't used yet. So we're adding to it, to a museum collection, in a different

way than has been traditional. And basically, you know, museums will have specimens in ethanol, they'll have specimens that are dried and pinned, they'll have specimens that are in drawers, and they'll have specimens that are in the biorepository in liquid nitrogen. So, to me, it seems to be a normal thing for a museum to be doing, which is to be adding to its collection.

Jonathan Coddington: The liquid nitrogen tanks hold tens of thousands of samples at -190°. At the moment, liquid nitrogen is the gold standard for long-term and, by long-term, the Smithsonian's in the forever business.

Chris Huddleston: Now we're starting to centralize our frozen tissue collections. So we're somewhere between 200,000 and a half a million samples. The reason we do this is people like to do genomic work, they do biogenetics, they do toxicology work with our samples. So researchers request samples, and we actually go in and we pull samples out, we cut a small piece of it, and send them out to the researchers.

Jonathan Coddington: Every time science jumps to a new phase, the museums will follow. Because the technology of doing genome sequence is advancing rapidly. By building a library of frozen tissue where you can do genomics of life on Earth, we'll be doing what museums have always done, which is to concentrate life into a collection that will support research.