Ocean Gazing: Episode 19
Clearing a carbon catastrophe
Chris Sabine: NOAA

<begin music>

Ari: This is Ocean Gazing where we take a plunge into the salty abyss, and then size up the water all around us. I'm Ari Daniel Shapiro. Today we're gonna focus on the surface of the ocean, that thin layer right where the sea touches the air above. Air with increasing amounts of carbon dioxide, a gas contributing to climate change.

Sabine: Carbon dioxide is moving between the atmosphere and the ocean: across that interface. You know, through the surface of the ocean.

Ari: Chris Sabine is passionate about the global climate crisis and its mounting impact on our oceans. He's an oceanographer with NOAA, the National Oceanic and Atmospheric Administration.

Sabine: But I'm also the chair of the International Ocean Carbon Coordination Project.

Ari: Kind of a tongue twister, but that project's rallying scientists from all over the world and networking them, coordinating them, and maximizing their science. Stay tuned to find out how.

<fade up music and sustain until it ends>

Sabine: There's carbon pretty much everywhere.

Ari: Carbon is the thread that stitches together life on Earth. It's found in proteins, DNA, RNA, fats, carbohydrates. Find a living creature, and you're looking at carbon. Carbon soars and flutters in the air. <fluttering noise, then a galloping sound> It gallops and slithers on land. <wave noise> And it swims and dives underwater.

But carbon isn't just in living organisms. It's also found in the gas called carbon dioxide, or CO_2. It's what we exhale, and plants inhale. It's also one of a handful of greenhouse gases that help keep our planet comfortably warm enough to live on.

Only a small percentage of Earth's carbon is bound up as CO2 in the atmosphere. But humans are pumping lots more of the stuff into the air. By burning fossil fuels to produce electricity. By driving cars and trucks and planes. And deforestation releases carbon stored in the trees. Carbon is a natural part of our world, but humans are moving way too much of it from its natural storage locations up into the atmosphere.

Sabine: Humans are creating about 9 petagrams of carbon per year that we're releasing into the atmosphere. And a petagram of carbon is 10^{15} grams, which also is not really understandable to people. So if you think of a railroad hopper car of coal. <fade up train noise> Right, if you've seen trains going by, there are these big railroad cars that are full of coal. <more train noise> Coal is about 80% carbon. Okay? And a railroad hopper car holds about 100 tons of coal, and they're about 60 feet long. Alright? So how long do you think a train would have to be to hold a petagram of carbon in the form of coal?

Ari: Do you want to make me guess?

Sabine: Sure.

Ari: Let's see, if I guess…

Ari: Okay, before I say my guess, what's your guess? How long would a train carrying one petagram of coal carbon be? Write your answer down, or say it to somebody sitting next to you.

Dad: I have no idea.

Ari: That's my dad. He wasn't sure, but while you're thinking, lemme say that these train noises were our last sonic stumper. <pause> Okay, all set? Here's my guess.

Ari: I don't know, how about the length from the west coast of the US to the east coast of the US?

Sabine: That's the answer that I always get. The real answer is the train would be 156,500 miles long. <more train noises> So a train holding one petagram of carbon would wrap around the earth 6 times. <lots of train noises> We're releasing 9 petagrams of carbon per year into the atmosphere. So now that train is wrapping around the Earth 54 times. So that's how much carbon we're putting into the atmosphere.

Ari: And what about your individual contribution to that railroad car? On average, if you live in the US, you produce 122 pounds of carbon dioxide every *day*. Every day!

This is a big problem. As more CO_2 billows up into the sky, climate change gets worse. CO_2 is being released 100 times faster than ever before in the history of our planet. And all this CO_2? It isn't just staying in the atmosphere.

Sabine: The oceans are absorbing right now about 25% of that. Ultimately the long-term storage spot for all that fossil fuel CO_2 that we're putting into the atmosphere is the oceans.

Ari: This extra CO_2 dissolving in the ocean is making the seas more acidic. The concern is that eventually, ocean acidification – that's what this is called, when the seas get more acidic – could dissolve away coral skeletons and disintegrate the shells right off of marine animals like snails and crabs and clams. The loss of these creatures would ricochet through the food web, starving fish, seabirds and marine mammals in the process.

And this is just one example of the things in the ocean large and small that are being impacted by the CO_2 that we're sending up into the atmosphere. But this isn't just a coral problem, or a marine snail or crab problem. Or even a United States problem. It's a global problem. And scientists need to work together to make headway fast.

Sabine: It's just that in practice that can be very difficult when you have one person in Tokyo, and another person in Woods Hole and another person's in Paris, France.

Ari: That's where the International Ocean Carbon Coordination Project comes in. I know, it's a long title. Say it with me. International Ocean Carbon Coordination Project.

Sabine: Our goal is to just to get the scientists all together in the same room. So what we do is we organize workshops where we bring the relevant scientists that are actually going on the ships and doing the measurements together, and say, "Okay, what is everybody doing?" And the first thing we do at every meeting is we put up a map and we draw lines of: "Here's where I'm going." "Here are our plans for the next 5 years." And it becomes very obvious: "Oh, well, gosh, that's right where I was gonna go." And the scientists that're organizing those particular cruises can work together and say, "Okay, well let's figure this out."

Ari: For example, Sabine's team used to make measurements in the Pacific Ocean on a ship that went from Tokyo to San Diego. Another group of Japanese scientists used to travel the <u>same</u> route and make the <u>same</u> measurements. The two groups weren't collaborating. But now, they work together to cover two *different* tracks.

Sabine: By sharing the resources and the data, we can put together a picture of the whole North Pacific that we couldn't before.

Ari: Sounds like you're in the friend-making business.

Sabine: I am. I try.

Ari: One of Sabine's friends is Akihiko Murata at the Japan Agency for Marine-Earth Science and Technology in Tokyo. Murata is part of the Japanese team covering that other track in the North Pacific. <Skype dialing and ringing sounds>

Murata: Moshi moshi. JAMSTEC desu.

Ari: I called Murata up on Skype and asked him about Chris Sabine.

Murata: My specialty is very, very close to Chris' specialty, so we are always talking about what's going on in the ocean. So I like to work with him.

Ari: The benefits of collaboration extend beyond just the science for Murata.

Murata: International cooperation for me is very, very exciting. Of course, Japanese culture is different from US culture.

Ari: Murata says that US scientists tend to have experience sharing their science with the public. And he's learning from them how to do the same thing, how to talk about his research to non-scientists.

Climate change is a global problem. We're all in this together and the teams that Sabine is coordinating are making sure their science priorities reflect that.

Sabine: The scientists in all the different fields of climate change and carbon chemistry are at unprecedented levels of coordination and cooperation. Climate change, you know, this is something big coming down, and we have to be thinking about it now.

<fade up transition music: something from Carbon Leaf>

Ari: And our next sonic stumper.

<fade up sonic stumper; fade up music at some point under next track>

Ari: Go to the website: www.coseenow.net/category/ocean to submit your guess. You'll also find an audio clip of Chris Sabine discussing his efforts to reduce his own carbon footprint. And what about you? Let us know how you conserve energy and minimize waste. Send an email or leave a message, and we'll use it in our next episode.

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Thanks to Kathy Tedesco, Jim Yoder, Janice McDonnell and Sage Lichtenwalner. Our music's by Evan Sanders. And don't forget to find us on Facebook. Become a fan of Ocean Gazing.