Ocean Gazing: Episode 7
The glide of a lifetime: Part I

<begin music>

Ari: This is Ocean Gazing, where we dive underwater and discover the oceans with our minds and ears. My name's Ari Daniel Shapiro. In mid-March, I took a trip to Rutgers University in New Jersey and met up with Oscar Schofield and Scott Glenn.

Schofield: A lot of people call us Scotscar because they forget which one's Scott and which one's Oscar.

Ari: For the record, this is Oscar.

Schofield: And we give joint talks and the reason is we can say twice as much. 'Cause one person can breathe while the other's talking and you can just keep going the entire time.

Ari: So I actually should've brought two mics.

Glenn: We can fit a lot in that way.

Ari: They fit so much in that we'll be devoting two episodes to this duo. So, stay tuned for Scotscar: Part I.

<fade up music; music ends>

Ari: When it comes to the ocean, Scott Glenn studies the physics and Oscar Schofield the biology. And their efforts are helping save lives. We'll get to that in a bit. For now, a lot of what they do boils down to one primary issue. Here's Oscar Schofield.

Schofield: One of the biggest problems that has held oceanography – especially the biology part – in check for hundreds of years: how do you follow a piece of water? If you got a cup of coffee and you pour milk in it and that milk swirls around, imagine if I had to follow one little parcel of that milk in that cup of coffee as it all mixes. And the ocean is being blown on by the winds, you got currents going, you got storms mixing everything up. It's really complex. How are we gonna follow anything in the ocean?

Ari: What's there to follow? Well, Schofield wants to follow the small plants of the ocean called phytoplankton. Glenn wants to follow different kinds of water – fresh water, salt water, warm water, cold water. And they're both interested in how their research areas overlap. Scott Glenn explains.

Glenn: We're very interested in interdisciplinary science studies – how does physics impact the biology and the chemistry and all that.

Ari: To understand these connections, Schofield and Glenn depend on a few technologies that –

Schofield: – tell you where to go in the ocean and when to go in the ocean. And if you solve the when and where problems, you can start asking why questions. And for the scientist, that's the gold.

Ari: We've already talked about a couple of these technologies on our last episode: satellites and a kind of radar called CODAR.

Glenn: You wanna do satellites, and I'll do CODAR?

Schofield: Yeah, we'll do the usual tagteam. Satellites – they give you a big spatial map. And what we can do with satellites is essentially tell you what's in the water. We can look at the temperature, we can look at the color. And that's gonna inform you on the biology, some of the physics.

Glenn: And then we get over to the HF radar.

Ari: HF radar is another name for CODAR.

Glenn: And we've been using those radars to map the ocean currents. So, with the satellites from space you know what's in the water. With the radars you know which way the water's going. However, it's all surface. Then we have to go on: what's going on below the surface.

Schofield: And that's where the gliders come in.

Ari: Gliders are about the size of one of your tall and lean friends – 6 feet tall and 125 pounds. They look like mini yellow submarines.

Beatles: We all live in a yellow submarine, a yellow submarine –

<scratching record sound>

Ari: Except no one lives in the glider at all. It's remote controlled.

Schofield: These gliders are robots. They have no propellers. <fade in sound of pump> They suck in a little water into their nose, which makes them just heavy enough to sink. <fade out sound of pump> And they have wings and a rudder so they fall forward, <fade in sound of pump> get to the depth they want, push the water out and now they're light, float up. <fade out sound of pump> So they're sinking and floating in a forward direction.

Glenn: The gliders have a payload bay. And in that payload bay we can put any sensor that'll fit. Standard sensors are the CTD: conductivity, temperature, depth, which we translate into temperature, salinity and depth profiles. So as it zigzags up and down through the water column, we're collecting those profiles. That's the physics. Now on top of that, we fill that thing full of optical sensors, acoustic sensors – anything we can to then measure what's in the water: sediment particles, phytoplankton, chemicals, things like that.

Schofield: And then every so often, they come to the surface, they make a global cell phone call to the lab, <fade up phone ringing> they talk to us, they dump their data, and they go back on their way.

Ari: That's right: these gliders literally call the lab at Rutgers using their onboard satellite phone and send in the data they just collected. This ringing phone is the answer to our last sonic stumper.

Without a propeller, the gliders need very little power.

Glenn: <bag rustling> These Christmas tree lights: they take about half a watt of power. <jingling lights> So if I take about 6 of these Christmas tree lights, that's the power that a glider takes. And so it samples the ocean and it can stay out there on very low power. We can be anywhere in the world ocean at any given time because they're cheap, they don't take a lot of power and they're constantly communicating wherever you are in the world.

Ari: And because people control the gliders from shore, the gliders can be sent on some pretty dangerous missions.

Glenn: If it's really violent and you lose the glider, it doesn't matter: nobody dies. It's just a robot. You can build another robot. <R2D2 noise>

Schofield: We're still sad, though. It's never nice losing a robot.

Glenn: But you still have to take chances in oceanography. It's a harsh environment. You're gonna lose some of your robots because we have to study these extreme events in these extreme environments. That's where the ships don't go, and that's where we gotta go with robots.

Schofield: It's really fun. And then, because of the global communications, we can actually look at the data in real time. So then we're sitting at home in our various homes, calling each other: you know, Scott, look at that re-suspension, it started at noon. Wow, look at that! And, it's kind of a nerd fest. But the fact that we can actually see those things is unprecedented.

Ari: One of Glenn's research interests is storms.

Glenn: The storms of course – they're important because: climate change. The ocean's heating up. The storm intensity seems to be getting more intense, more intense hurricanes, maybe more often. And so, how do you make better forecast models for that? That's the big science message: how do we get these gliders out to measure the top part of the ocean in a storm?

Ari: And there are times when a lot of people pay attention to this science message. Glenn recalls one Labor Day weekend when a bunch of research ships and gliders were deployed for an experiment off the New Jersey coast.

Glenn: And we had the forecast for a tropical storm – a hurricane at the time to come through the area. And so what do you do? Ships don't like hurricanes, but we had a forecast that said it was coming inland and we wouldn't have to worry. But we then had some of our own experimental forecasts that said this tropical storm was gonna undergo transition. A storm that undergoes transition is when it gets broader: the path of high winds gets bigger and bigger and bigger. And that's what we were forecasting to happen. And those high winds were going to be right over our ships. And so we get this information – we get the latest weather forecast. It's 5 a.m. on Friday morning and it's due to hit at midnight on Saturday.

What do we tell the ships to do? Well, we believed our forecast model. We told our ships to head out to sea, to get away from the storm. We took the gliders: we turned them straight into the storm. There's no people, it doesn't matter – they can get beat up all we want. We wanted to sample that thing. And so the storm starts arriving.

Later on in the day, the governor's office calls, and he has all the mayors from the Delaware Bay on the phone, and they were deciding: is this going to flood the Delaware? They were worried about: what do we do with the reservoirs upstream? The reservoirs are the drinking water for New York City, so they like to keep 'em high. Do we have to lower them to make room for this water that's coming from this tropical storm so we don't flood the river? If we lower them and let that water pulse come out, is it going to intersect the water pulse from the storm and make it worse? And so they had to make this decision in a few hours as to what they were gonna do. And based on the weather forecast, no, we saw the rain was gonna be farther offshore, it was gonna be to our south. We didn't have to worry about what was going to happen on the Delaware. We have to worry about what was happening on the coast because that's where the big waves were gonna be. So instead of sending the state police to the Delaware, send the state police to the coast: that's where the big waves are.

A few minutes later, PSE&G, Public Service Electric & Gas, the power company, calls us up. The storm's coming. They want to know where the most severe weather's gonna be because they want to pre-position their electricity trucks, their repair trucks. They want to get the trucks out before the storm so when it hits and everything comes down, the trucks are already there to be in place and fix it. It was

Labor Day weekend. They were playing triple overtime. They didn't want to send all the crews out everywhere if they didn't need 'em. But they wanted the critical crews in the right place at the right time.

So, by 9 a.m. that morning, we had sent our fleet off to sea – the research fleet, the ships – go off to sea, stay away from the storm, we turned the gliders, move them into the storm, we told 'em: keep the dams closed for New York City, save their water, you're not gonna have a flood on the Delaware, send the state police to the coast, that's where the big waves are gonna be, and send the power company trucks to the north where the storm was worst around New York City area, and all before 9 a.m. 9 a.m. comes, our students come in, and we start a normal day at work.

<musical transition; fade up sonic stumper>

Ari: Try to figure out this sonic stumper.

Any ideas? Or have a question for Oscar Schofield and Scott Glenn? Well, glide on over to our website and drop us an email or leave us a message. It's www.coseenow.net/category/ocean. You'll also find photos and additional audio of Schofield and Glenn.

We also need *your* stories about the ocean – memories from when you were little, an experience at the beach or on a whale watch trip, the first time you tasted the ocean. We'll use these in an upcoming episode! Go to our website to submit your story!

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<R2D2 noise>

What's that?

<R2D2 noise>

Oh, yes, of course: see you in two weeks!