Ocean Gazing: Episode 6
Top models: Huijie Xue gazes into the future of the Gulf of Maine

<begin music>

Ari: It's been two weeks, so it's time for the Ocean Gazing podcast! I'm Ari Daniel Shapiro. We feature Huijie Xue, a professor at the University of Maine, in this episode.

Xue: I hope it will turn out as good as the rest of the podcasts! <laughs>

Ari: She's trying to predict the future, in one place in particular: the Gulf of Maine.

Xue: Definitely for us, it's a fascinating playground.

Ari: We'll hear an answer to one of your questions, and toss out the next sonic stumper. Stay tuned.

<fade up music; music ends>

Ari: Huijie Xue grew up in China. And she's been interested in the ocean since she was a little girl for a few reasons.

Xue: I was born right along the coast, a couple kilometers away from the water. I always liked the seafood, and that's another reason I guess. Back in high school years, I remember I was reading an article about the wave energy and the tidal energy. That certainly appealed to me a lot.

Ari: All this got Xue to study oceanography. And now she models.

<fade up Top Model music>

Tyra Banks: Being a top model means entering a whole new world…

<fade music down>

Ari: Okay, maybe not *that* kind of modeling. But Xue's modeling requires her to enter a whole new world too.

Xue: I'm a modeler so what I use is the data gathered in the field and then we put it in a computer. And based on physical principles, we construct a model ocean in the computer.

Ari: So Xue takes measurements from the real ocean and uses those to recreate a virtual ocean in her computer. Her goal is to use what's happening today to predict

what'll happen tomorrow. It's a lot like the weather forecast, but for the ocean. And there are a lotta folks that're interested.

Xue: We have recreational boaters. They want to know the current and the water height at certain locations.

Ari: Not to mention the coast guard, fishermen and people operating vessels for research, commerce and shipping. Now, Xue doesn't study the whole ocean. Instead, she focuses her attention on the Gulf of Maine, a body of water that extends from Cape Cod, Massachusetts to the southern tip of Nova Scotia.

Xue: Really Gulf of Maine has all the processes that a physical oceanographer will be interested in there.

Ari: And these processes make the Gulf of Maine a top place to model.

<fade up Top Model music under Xue's next track>

Xue: It has wind-driven currents, density-driven currents, it has winter overturning, strong river plumes, tidal currents, rains, Gulf Stream nearby, fresh water from the north. Everything gets mixed inside the Gulf, which really creates a very dynamic system for us.

<music ends>

Ari: Xue tries to predict how all this water will move around the Gulf of Maine. She relies on supercomputers to do it. And Xue plans to use data from 3 pieces of technology to improve her forecasts. The first: satellites, which provide –

Xue: – the surface temperature, mostly.

Ari: It's how warm the skin of the Gulf is. A skin no thicker than a piece of paper. The second technology is something called CODAR, a kind of long-range radar. The CODAR station is based on land, and it sends out pulses that sound something like this.

<fade up CODAR>

It's the answer to our last sonic stumper. Such a pulse –

Xue: – bounces off the ocean surface,

Ari: and returns to the CODAR station. <fade out CODAR> It gives information on –

Xue: – how fast the surface of the water moves.

Ari: In other words, it provides the speed of the ocean surface.

Xue: The surface velocity.

Ari: Technology number 3 is a dozen buoys scattered throughout the Gulf of Maine.

Xue: They have instruments throughout the water column, measuring temperature, salinity at certain depths. And also the current speed at various depths. They are beamed back to shore to a central location, and we can all download the information.

Ari: The satellite, CODAR and buoys are all pieces of the puzzle. And Xue tries to fill in the rest with her model.

<fade up ocean noise>

Let me give you a sense for how Xue goes about doing this. Imagine you went to one part of the Gulf of Maine, cupped your hands together, and took a small volume of water. And let's say this water is warm and fresh.

Now you go to another part of the Gulf, cup your hands together again, and take another small volume of water.

Xue: But you have to be very accurate to make sure that you pick up the same amount of water, or you have to keep your hand in a certain shape, not changing it.

Ari: Right. And let's say this new bit of water is colder and saltier than the first bit. That'll make it heavier so it sinks.

Xue: Vertically you always find the heavier water at deeper level.

Ari: Whereas warmer, fresher water floats because it's lighter.

<fade out ocean noise>

This kind of information, combined with the direction and speed of the currents, helps Xue figure out where and how the water's moving. The ultimate high for Xue is when her predictions of the future actually come true. It can be pretty exciting.

Xue: You just jump up, say, "Aha, I know I can do this!"

Ari: So literally you jump up out of your chair?

Xue: I would say that I'm not that kind of person to jump up from my chair, but I'll be smiling.

Ari: When it works, Xue can use her model to predict the movement of an oil spill, or the location of someone who's gone overboard and is now adrift. She's even taking her science back to China.

Xue: I've been giving various talks in China. Of course they are also interested in setting up similar systems. I was in Beijing early this month [people from] talking to the National Marine Environment Forecast Center. And they are very interested in how we link the forecast result directly with management tools and so on.

Ari: Xue has come full circle. She uses data from the ocean to look into the future. And it's brought her right back to China, where her love of the ocean began so many years ago.

<music transition>

Ari: And now, for one of your questions. Liesl Hotaling, the chief education officer with the Beacon Institute for Rivers and Estuaries in New York state, left a message on our voice mail box. It was for John Orcutt and Frank Vernon who we featured on our last episode.

Hotaling: First of all, I never would have guessed that the sonic stumper was a listen into your server room. That was just an amazing thing to hear. It made me question: Google and others are working on tidal and wave-powered data centers. Would OOI ever consider using the ocean that it's measuring as a power source to process the ocean data? Just curious.

Orcutt: Hello, this is John Orcutt. Frank Vernon's here as well. The buoys that we're using will use wind power and solar power. The reason we're not using wave power as such is the buoys that we're actually employing are called wave follower buoys in that they follow the waves up and down as they pass by. And it's difficult under those circumstances – without a stable platform – very hard to use the wave power itself.

Vernon: And another aspect from the cyber-infrastructure is that we're actually trying to avoid buying our own large computer and storage grids, and instead we'll be using the elastic computing and storage system provided by Amazon. Thanks, bye.

Hotaling: Thanks. Bye.

Orcutt: Bye.

Ari: Okay, onto the sonic stumper!

<fade up sonic stumper>

Ari: Call in to give us your guess on what this is, or to leave a message for Huijie Xue.

<fade out sonic stumper>

We also want to hear your stories about the ocean. It can be a story about the time you touched the ocean for the first time, or a memorable ride you took aboard a boat.

<fade up music>

To find out how to contact us, go to our website: www.coseenow.net/category/ocean. That's www – dot – c – o – s – e – e – n – o – w – dot net slash category slash ocean. Once you're there, you'll also find photos and video of Huijie Xue's models and audio of her talking about lobsters.

Is there anything else?

Xue: Well, thank you –

Ari: Ah, yes. The credits.

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Have a good couple weeks!

<fade music up; music ends>