FLL Webinar Transcript

JANICE:

Okay. Here we go.

Okay. Awesome. All right. I think we should get going. I think we've got a lot of ground to cover this evening, so we're going to get started. Thanks for, if you haven't already, if you just joined us, go ahead and introduce yourself in the chat. Langston, I'm going to introduce the team and just get you set up for this evening.

Let me pull up this slide. Hang on a second. There we go. My name is Janice McDonnell. I am the STEM agent in the Department of 4-H Youth Development and I also work very closely with the marine scientists here at the Department of Marine and Coastal Sciences, which is at Rutgers University, your state university here in New Jersey.

We are in the Department of Marine Coastal, calling you today from the Department of Marine and Coastal Sciences, which is located on at the school of Environment and Biological Sciences, and that is part of, the Cook campus. So we're really happy to be with you today. We had a lot of interest in this in this Ocean challenge this year, which we're going to talk more about in a minute.

I just want to tell you briefly a little bit about the little picture you see there, which is the front of our building. Marine and Coastal Sciences has been around for the early 90s. We started doing marine research here at Rutgers. And we have a team of about 30 to 40 research faculty that study everything about the ocean, from the biology to the chemistry to the physics of how the ocean moves.

And we spend a lot of time thinking about ocean challenges, which is why many of you have reached out to us for this FIRST Lego League robotics challenge. So, we're really happy to have you here. You're here from all over the country. We're glad you're here. Just a couple of housekeeping things before I turn it over to my colleague Mitaali Taskar. There's some housekeeping things. We'll ask you to stay muted through the initial presentation. And then we have a section, coming up towards the middle of the program where we're going to be addressing some of your questions. And of course, at that part, at that point, we will we will call out different teams and ask you to share your question for the group.

And then we have prepared responses to those. So we'll ask that one team member, please read your pre-selected question, when prompted. Okay. But before we do that, we want to share a little bit more about, about our Center for Ocean Observing Leadership.

And you're going to hear from some of our wonderful students and some of our, our, our director of the Coastal Center for Ocean Observing Leadership in just a few minutes and we'll tell you more about our ocean robots and how they all work. So I've already introduced you to Langston Span, who is going to be our master of ceremonies here. Langston is an undergraduate. Langston, you want to unmute and just say a few words about your yourself and how you find yourself here at Marine and Coastal Sciences.

LANGSTON:

Sure. I am a sophomore at Rutgers. I'm an intern for the Department of Marine and Coastal Sciences. I am going to be monitoring the chat and help you guys out with questions. If you guys haven't already, please tell us your team name, where you're from and how many people are on your team. We're so excited to have you guys here.

JANICE:

Thanks, Langston. Next up is I'm going to introduce Mitaali. Mitaali Taskar is a science communicator and she's going to have a few words for you about this evening's event.

MITAALI:

Hi. Yes. I'm Mitaali. Like Janice said, I'm a science communicator here at the department. And I'm also a fellow first alarm. So like she said, we're here today because we've got a lot of requests about our lab and what we do at this department.

So we're hoping to take you through the COOL room and our glider lab, where we prepare our underwater gliders to for their adventures down below. So we hope that you'll find that the FIRST core values of teamwork, inclusion, impact, fun, discovery and innovation are. You'll see that they're present in our own work here at the center. What y'all are embodying are what we embody as well.

And now we know that you've been tasked to design a Lego robot to compete the submerged game, like modeling different scientific and engineering tests on a game mat. And we also know you also have to identify a problem to solve and design a solution to solve the ocean's biggest problems. So to talk about that, we're actually going to shift gears and we're going to, we're gonna go to Mya and Leah.

MYA:

Hello everyone. My name is Mya and I'm a second year graduate student here at Rutgers and I study biological oceanography. And I focus on phytoplankton in Antarctica.

LEAH:

Hi everyone. My name is Leah. I am a third year Ph.D. student and I focus on hurricane research. So how hurricanes really influence coastal ocean circulation.

MYA:

We're happy to be here with you all tonight.

And we'll pass it over to the glider lab.

AIDEN:

Hello. I am Aiden. I'm a sophomore here at Rutgers. I'm studying directed marine sciences, and,

HELENA:

Hello, I'm Helena Messihi. I'm an undergraduate here as well, and I am studying biological oceanography. And here we're going to talk more about why we use gliders and how they work.

JANICE:

Okay. And I think the last bit of introduction should go to the COOL room right there. Mike, are you going to introduce yourself? There he is.

MIKE:

Hey, guys. Mike Crowley, I'm part of the Rutgers University Center for Ocean Observing Leadership, or RUCOOL. You guys got a lot of cool acronyms. So we've got

RUCOOL as our acronym. I'm going to talk about a lot of the global reach that we have on, on, ocean research and then get down to our own backyard here in the Mid-Atlantic.

JANICE:

Thanks, Mike. Now we're going to head back to Mya and Leah, and they're going to talk a little bit about the the challenges our ocean is facing, because at the end of the day, that's why you're all here.

So let's take a few minutes and hear from, two of our best students here, and they'll talk a little bit about these challenges. Yes. Okay, so take it away Mya and Leah.

MYA:

Thank you, Janice. I'm going to share my screen.

I'll just share my entire screen.

All right. So. Hello, everyone. Today we'll be discussing the big problems that our ocean is facing.

All right, so the ocean covers most of our planet, and they keep. They help keep our ocean healthy, and. But they're in trouble. And we need to understand what's going on so we can help them. So during the poll, you all gave a lot of great responses for all the many issues that are impacting our ocean. But tonight we'll look at five main issues: sea level rise, ocean acidification, microplastics, overfishing and nutrient runoff.

And it was great to see that a lot of you all put that in the poll. So that's awesome that you all are aware.

So what is sea level rise? Sea level rise is one of the major results of climate change. So glaciers store most of the Earth's freshwater due to the Earth's warming. Glaciers and ice sheets are melting rapidly compared to the ocean, making sea levels much higher and higher. So what does higher seas mean? That homes that are located on the coast, like beaches or towns on the coast, are more susceptible to flooding. And sea level rise can also change where animals and plants that live along the shore, like in marshes and mangroves, these areas are nurseries for certain fish and animals and they can change due to sea level rise.

So sea level can impact all lives, us and animals. And for my research, I focus on the water that comes from glaciers melting in Antarctica. And I'm really focused on how this meltwater influences the phytoplankton that we see in the surface ocean.

Now let's discuss ocean acidification, right? When we burn things like coal and gasoline, they release this gas called carbon dioxide into the atmosphere. And the ocean takes up this carbon dioxide, and it makes the water more acidic. So why is acidity negative for the ocean? It can make it harder for creatures that have shells, like oysters and corals, to build their physical structures.

So coral reefs are typically a very colorful habitat for many animals. When we have acidic oceans, we can see that it's harmful to corals and causes them to bleach and die.

Now let's talk about plastic pollution. Plastic is everywhere. And when it gets into the ocean, it breaks down into very tiny little pieces called microplastics. And these tiny pieces are so small we can't even see them. And they can come from all kinds of things, like water bottles, plastic bags, fibers in our clothes. So when we wash our clothes, the tiny pieces of the plastic can get into the water and into the rivers and eventually end up in our ocean.

And some animals may even think that microplastics are food, and they would ingest them, they would eat them, causing blockages in their stomach, not allowing them to eat the actual real food. And this makes the animals in the ocean very sick. So the problem with microplastics is that they're very tiny and they're tough to remove from the ocean, and they build up over time.

LEAH:

So now I want to talk about the problems facing our larger fish fish communities. Overfishing is when we catch too many fish from the ocean too quickly. This is bad because our fish really need time to grow and have babies, but overfishing doesn't really give them the time to recover and have their babies. Fish are part of the ocean food chain, so they're very, very important.

If there aren't enough fish, it affects the whole food chain, from small fish to big fish and even the small--even the animals that eat fish like birds and sea lions. But we need them. We need to. We need to catch fish carefully so there's enough for everyone, including all the animals in the ocean.

So now let's go into another problem: our nutrient runoff problem. It's called, excuse me. When people use fertilizers on crops, rainfall, some of it runs into our rivers and eventually into our oceans. Fertilizers make algae grow super fast, creating huge algal blooms. But when that algal die, they use up the oxygen in the water. Without oxygen, fish and other animals can't survive in these areas and become dead zones. Sometimes we have algae that are even toxic when they bloom.

They are dangerous for animals and for people. When these toxic algal blooms happen, they make shellfish unsafe to eat and harm fish and other marine life to keep dead zones and harmful algal blooms from happening, we really need to use fewer chemicals on land that end up in the ocean. Now, to really explore all these challenges, we need to understand some of the tools that are at our disposal, such as our STEM challenge kits.

Here is an ocean inspired board game where you can navigate our ocean robot around the world while learning key ocean concepts such as aquaculture, climate change, technological innovation, human impact, and the ocean ecosystem at large.

So, the ocean really, really needs our help. There are big problems facing the ocean, like rising sea levels, acidic water, tiny plastics, too much fishing and nutrient runoff. These things really hurt our ocean animals and plants and even make things harder for us. But the good news is that we really can help. Small changes like recycling, being careful with chemicals, and eating sustainable seafood can make a big difference.

If we all work together, we can help protect the ocean and keep it really healthy for our future.

JANICE:

Great job guys. Thank you Mya. Thank you Leah. That was a really nice overview. And again, if you want to learn more, and practice navigating the ocean's problems, definitely check out the 4-H STEM challenge. That's why we created it for, for instances like this where you want to learn more about the challenges and how robots interface with that.

So definitely encourage you to check that out. Now we're going to pop over to the COOL room again, and we're going to hear from Mike a little more about our ocean robots and what they can do to help solve these problems. So, Mike, you want to take it away?

MIKE:

All set.

Do I have to share or is it pinned?

JANICE:

No, he's going to pin you. Go ahead. You get started by the time we will figure it out.

MIKE:

All right, so, I'm Mike Crowley. So I have been here quite a long time since. Since, well, when your when your parents were younger, going back to the 90s. And if you go way back in the history of oceanography, what we did for years, going back to the 1800s, even 1700s, we would take boats out, right, take boats out, maybe put a little temperature instrument in the water to get temperature or get a cup of water.

So we'd be out in boats, we'd be out in the ocean trying to do research in the ocean. And that continued. That continued for over 100 years. Now we're starting to get more remote. Remote sensing of the ocean. So my group here at Rutgers has prided ourselves for about, well, about 30 years now on trying to bring the ocean into this classroom.

So I'm in a classroom, we call this the COOL room. And you see the monitors behind me. Also right behind the camera, there's another duplicate monitor there, too. But this is a classroom where we bring all the data that we gather and that all sorts of other groups gather from around the world, not just from new Jersey, not just from the Mid-Atlantic, but you see up here, but from around the world.

We do it remotely, right? You guys are aware of buoys, right? Buoys are kind of a remote sensor. You put the buoy in the water, it sits in a spot, and it gets you all sorts of information about what's happening at that one spot. That's that's kind of it. It's it's remotely sensing for us because we're not out there.

But it's right there in the ocean. So what we've done over the years is we we started with looking at the surface of the ocean here. And what you see behind me. I'll go over here. This is, this is New Jersey right here, right. Long Island. We are we are in New Brunswick, which is right here, as someone mentioned, Princeton.

I live in Lawrenceville. That's right down here, Cape May. Right. Delaware, Maryland, Virginia, North Carolina, Cape Cod up here. So this is all land. What you're seeing here, all the color. That's ocean temperature. So that's the surface of the ocean. That's the surface temperature of the ocean. It's a satellite image. So it's remotely sensing from about 20,000 miles away from the planet.

It's remotely sensing the temperature of the ocean. We can also get information about ocean color. So we can see from that far away what phytoplankton look like. You see little spots here that aren't (solved?) right here, down here, here. Those are actually clouds. So the satellite can't see through clouds. This happens to be a really nice, clear satellite image.

But you see this temperature here? This is the Gulf Stream offshore, this snake that goes through the ocean and pushes hot water all the way across the Atlantic to England and Ireland. You can see on our coast, it's cooled off quite a bit near the coast and then up at Cape Cod and Boston, it's a whole lot cooler up there.

But we get this data hourly, Now, a lot of times it has a lot of clouds, but we get this data remotely sense. Bring it here. Another type of data that we get is from an instrument, called HF(?) radar. And I'll show you what it looks like. It's a white antenna. Looks something like this. It's just a white post.

And we put them right on the beaches. And what they do is they get us information about surface currents of the ocean. So all these little red dots up and down the coastline, are HFR antennas at different beaches, you can see, is a whole bunch here in new Jersey. And what they do is they're measuring the surface currents of the ocean.

So now we're remotely sensing the surface currents. So we have the the temperature. And now we have little arrows. It might be hard to see on your screen, but there's little arrows all over this image of surface currents. So we can see every hour where the water's moving. So the Coast Guard uses that information for search and rescue operations.

I saw someone had a question about search and rescue. That data goes straight to the coast guard and they use it every single day, because in this area they have to make an average of five rescues every day. And they use this because they know where people are floating to, if their boats are having a problem in the ocean.

So now we have a satellite data, temperatures, we can see where everything's moving, but we don't know what's going on underneath the water. So these little black lines here are all gliders, these ocean gliders that are out in the water that are actually in swimming through the water. So now we're going to go to the lab with Helena and Aiden, and they're going to teach you a little bit about how these gliders work and what they are.

AIDEN:

Hello can you guys hear us?

MIKE:

Yep.

AIDEN:

Okay. Great. All right. Here at the Rutgers Marine and Coastal Science Program, we engineer, program, put together and then send out these gliders to deploy so they can collect data from the oceans. Gliders have become an essential part of ocean research, and they're incredibly useful with the data they're able to collect. But why do we use them?

From a budgeting perspective, gliders cost around $300,000, and that's actually much cheaper than what a boat expedition would be. So we can allocate that that money elsewhere in the department. And it allows us to do a lot more things with the same amount of money. For a normal boat trip, you have way more things that you consider that a drone that just has all the equipment, they're all set up.

You have to you have to have a crew, a ship, scientists, equipment and time. And that adds up. They can get up to, like, $1 million in cost, which is not ideal when you want to be doing research expeditions all the time. Not only that, but gliders solve all the problems that come with human shortcomings, our our gliders eliminate any safety issues that come with boat trips because there's no one there to get hurt.

That means natural hazards like rough waters and storms don't phase our gliders because those conditions, like, well, they might be bad for people, the gliders don't care. They're not living. In fact, for things like hurricanes, which would delay a boat trip and maybe postpone any research for a good week or a month, we actually try to get these drones out there because they get all the valuable data that we couldn't get, otherwise.

Additionally, humans have to eat, sleep, you know, all that stuff you have to do that interrupts your work. The gliders don't have to do any of that. They can go 24/7 for weeks on end collecting continuous data that helps us in the long run, because people can't do that consistently. They are built extremely strong and they can't break.

And while they might get into a shark attack or two, you never know what happens out there, we can almost always bring them back, fix them up, and then send them right back out. This persistent engineering allows them to handle all types of environments: warm, cold, rough, whatever. And we be able to deploy them in various places from across the group, across the globe.

This is the North Atlantic, Mid Atlantic, South Atlantic. We've done the Eastern Pacific. We've done Antarctica. They can go everywhere. Even if humans can't go there, they can handle it. And that's why they're so great. And now I'm going to hand off, to my colleague Helena, who's going to talk about what they do during these expeditions. All right.

HELENA

Just going to clip this on real quick.

Oh.

All right. Hi, everybody. I'm Helena. So I'm going to talk more about how the gliders work and how do they do what they do. So when it comes to glider movement, it's very important that our glider maintains neutral buoyancy, which means that it's roughly as dense as the seawater surrounding it. So the glider. I'm going to direct you over to the glider.

This is our glider at the top part of the glider we have the buoyancy pump. So I will show a video in a second, but I'll explain it real quick first. So what it does when it's at the surface, the buoyancy pump will suck in about two cups of water so that the head starts to get heavier and as the glider starts to sink, the batteries will also move forward and accelerate that sinking and it won't sink straight down, however, because it has these wings on both sides. So it'll kind of glide forward through the water as it sinks. The glider can also detect its distance from the bottom, so once it reaches a certain point--by the way, it can get about like 1000m deep. That's the maximum. So once it detects the bottom and it decides to come back up as we tell it to, the water will be pushed back out of the head of the glider.

The head will become lighter, the batteries will move backwards again, and it'll start gliding using its wings back up to the surface. And then once it gets to the surface, the tail will stick out. Here, I'll point this over to a better view of the tail real quick. This tail pogo stick out. That's where our satellite antenna is.

And we receive the data from the satellite, or from this tail, once this balloon deflates so it sticks up a bit more. So real quick I'm going to share a video that better depicts this.

Can you guys see my screen or no.

LANGSTON:

Not yet.

HELENA:

Okay. I'll try again.

JANICE:

Helena, do you want me to try to do it for you?

HELENA:

Yeah, sure. That would be great.

JANICE:

All right, let's see if I can get it working. Hang on one second, everyone. So let's try this, all right? can you all see that, I hope.

Okay. There we go. Are you seeing it?

HELENA:

Yep.

JANICE:

Good. Okay. Perfect.

HELENA:

All right, so as you can see, the buoyancy pump sucks in the water and the head is tilted down and the batteries move forward so it glides down in the water. The rudder at the back of the tail is what we use to steer. So we can change direction.

And then now we've reached a certain distance and we're pushing the water back out and the head will become lighter as the batteries move back and it'll start to float again.

Now we're at the surface and we can receive that data.

Right. Awesome.

All right, now back here, what's also very important is the tools we need to, measure, oh, and get all this data. So right here in the middle of our glider, we have the instrument bay. And there we can make all these different attachments. Sorry, a lot of moving. So first of all, we have our acoustic, zooplankton fish profiler.

So what that does is it sends sound waves to the bottom of the ocean. And the frequency that we receive measures zooplankton up to fish. Zooplankton being those small little critters in the water. And it can determine size and shape based off these frequencies. And then from that we can determine the exact species, so we can measure amount and kind with that.

Then we have this thing right here, this amber bulb attachment and, that actually listens for whales. And based off of the sound that it gets, it can determine the exact species of the whale. This right here is our acoustic Doppler current profiler. It's very similar to the acoustic zooplankton fish profiler, except it doesn't measure zooplankton fish.

It measures water currents and how the water is moving. So again, it sends acoustic beams down through the water. And from the frequency that it receives, it can determine direction and speed of water. And it does this every meter or so. It sends out these beams. And that's very important for measuring ocean currents. And then over to a glider.

The actual glider. So this attachment right here, that's what measures temperature and salinity. So that's our temperature and salinometer (?). And that's on every single glider that we have. So every one of our glider that's that is deployed takes these measurements and then back on over. Over here we have an Eco Puck. So what this attachment does is it detects chlorophyl like the satellite imagery does as well.

And we can measure the phytoplankton within the water. And then right over here, we have the-- this black bulb measures sediments in the water and how much sand and at what depth. And you might be asking, why would there be sand anywhere except for the bottom of the ocean? Well, when extreme weather conditions happen, hurricanes and storms, this disturbs the sand at the bottom of the ocean, and it ends up mixing the water within this water column.

And so it can measure all sorts of mixing and destruction of that water. And then we also have a pH sensor which is very important for the ocean acidification application. Seawater is typically around 7.8 to 8 on the pH scale. And we can use this measurement to find out outliers and how acidified our ocean has become.

Then back on over our last little attachment here is themco (?). So it's this kind of bullet like thing. And it's a receiver on the top of the glider. And what it does is listen for tagged animals. So any animal that has been tagged with an acoustic tag, we can track them within a 0.5 mile radius and we can determine the exact individual it is.

So we also have, the battery pack, as you saw in the video, it's located around here on the glider. That's what we where we get our electrical power. And also very important for the movement of the glider, as you saw in the video. And then back over here. This is our computer this big, this is our big computer.

So that's all our software. And, so information is inputted by the instruments and that's what tells it to do so. And then it's given to us based on what that computer tells us. And then back to the tail over here. As you saw in the video, this is the rudder is what it's used for steering. So we can tell to go somewhere and that's where it will go.

And the antenna will be located right here. And that will give us our information. Thank you.

JANICE

Thanks Helena and Aiden. That was great. Now we're going to move back to Mike Crowley, who's going to talk a little bit about how what the data looks like once the glider does its thing and collects all the information, like Helena and Aiden were telling us. Then what happens, Mike? What does it look like?

MIKE:

All right, so I was going to do this with the lights on, but I think I'm going to do it with the lights off because you guys can see these well these light reflections. So I think it might be easier to see the screen like this, although I'll just be a silhouette here. So, what you're seeing on screen is actual data from a glider. So up here, right, up here, there's a track of a glider off New Jersey.

It's a little V, just the V shape. It left Sandy Hook at the top, went offshore and is heading back in. It's a V shape. So right down here is a cross-section of that data. So let's see if I can get you in a little bit better. So there's a cross-section of that data. On the left side is this is the depth from zero down to 80m, down here 80m.

And the color is temperature. So the dark blues are cold and the orange and reds are very hot water or warm water. So this is just time. So this glider started off Sandy Hook in shallow water at about 25m and then went across offshore it it's moving across offshore to deeper water. And now it's starting to go back in again.

So over here there's a whole bunch of different cross-section plots. So we have salinity, we have temperature, we have pH, so acidification. That's this, this one right here. That's ocean pH. Chlorophyll. So phytoplankton is this green one down here. CDM(?) and top right up here is our whale detection data. So you can see the line plot of the glider.

And then there's these, red dots on the track. And what you're seeing here is it's telling you that this glider heard fin whales, several fin whales offshore are these red dots over here. So I'll go back on here. So fin whales over here. And as we go down, if you can see this. So now the same track.

This is humpback whales. So there's a whole lot of humpback whales offshore. And that's something that we've seen a lot of over the last couple of decades is the humpback whales have increased offshore. And then this one has one single little dot. So yellow dot is a little tiny dot. It's a maybe. And that is a right whale that it may have heard.

So what these gliders are able to do is get all these different data sets together. And then we put them together with the satellite data, the radar data on the surface. And we get this whole three dimensional view of what's happening below the ocean. So that's a little overview of what we do and everything you're actually seeing here.

Everything I've shown you today is available online to you guys to see. Nothing we do here is controlled or in-house. Everything, we put out to the public. And we've been doing it since 1994 when the internet first started. We started putting our satellite data up online, and our gliders have been around since about 2004. So for the last 20 years, as soon as that glider hits the surface and talks to us via that sate--, that satellite communications link, that data comes in and we send it out to the, to the internet, to be used and for people to view.

These are all public websites. Alright back to you guys.

JANICE:

Thanks, Mike. Okay, that brings us to the end of our presentation. What we were planning now is to have, have you guys, get some answers to some of your questions. All of you submitted them beforehand. So we, we would like to call out each team.

And then if you would have one member of your team, please read the predetermined question. And then we prepared some responses to those questions to kind of help, help you get your answers. So, I think we're going to start, with, Belmont Hills. Is Belmont Hills here, is there a representative from Belmont Hills that we can hear from tonight?

And please introduce yourself if you are unmute and introduce yourself.

Anyone here from Belmont?

No, not here tonight.

LANGSTON:

I think we have Mary Savage who is.

JANICE:

Oh, okay. Yeah. Mary, can you can you unmute and ask your your question? It's a great one.

Oh, it's not. Okay. Good to know. How do we unmute. How do we unmute her.

MARY:

Oh there we go I got it

JANICE:

okay great. Go ahead. All right.

MARY:

And I apologize. I actually don't have the predetermined question in front of me. Do you have the question?

JANICE:

Yeah. Yeah we do right here. So the question from your team was, what is a day in the life of people who work on the ocean for their research, which we thought was a great question.

So, I think we're going to let Mya answer that, because Mya has spent more time than a lot of us out on the water, and she's going to give you some ideas about what it's like to be a researcher. Go ahead, Mya.

MYA:

Thank you. I would gladly answer that question. So the life of a person that studies the ocean can vary throughout the year.

So as it being a scientist, the basis of it is asking a question. And sometimes you're asking a question that no one's ever thought of before. So you spend a lot of time figuring out, you know, how do I want to answer this question? Where do I want to conduct this research? You know, when do I want to conduct this research?

So the first the first half of answering this question will be, you know, just planning. So once you have everything in order, if you find yourself wanting to study in Antarctica, you have to go on a research vessel. So, you'll be on a cruise and you would spend a few hours a day, collecting water samples. So I study phytoplankton.

So I want to know, you know, how happy are phytoplankton? I want to know how much phytoplankton are there. And I also want to know the environment surrounding the phytoplankton. What's the temperature like? How much freshwater is there influencing how salty the water is? How dense is the water? So I'll collect samples of that like that.

So once the entire cruise is done, I spent a month and some change collecting samples every day. Understanding trends of phytoplankton over a certain area. Then I'll find myself back at the building. And at this point, I'll spend more time in the lab. Now I have all my samples. Now it's time to analyze them all. So I would run my samples, and then I can actually find out, you know, how much phytoplankton were there, how happy were they?

And then I can look at, if I have, data from previous years, I can look at, you know, is their happiness changing throughout time? And how much phytoplankton is changing throughout time. And also, you know, what kind of phytoplankton am I seeing there? And is this changing throughout time? So the year can look very different for me, from starting in the office to in the field on a ship to being in the lab, and I love all parts of it.

But I would say my favorite thing is kind of hard. I love being in the field collecting samples, but then also analyzing them and understanding them, and then you tell a story on them. And also sharing the research that you've conducted is also a major part too. So I can't pick a favorite. But yeah, that's what life as a person who studies in the ocean sounds like it looks like.

JANICE:

Thanks, Maya. We asked Mike to add his perspective because he studies the ocean a little bit differently. As a researcher, Mike, you want to share your perspective.

MIKE:

Sure. So going back 25 years ago, I used to go out about into the ocean about 15 cruises per year, and we did that for a few years.

And and like Mya, we would get all this data, we'd go out and a bunch of cruises or for a month or so, and then we spent the rest of the year studying it. Over the last 14 years, or almost 15. Right? Since 2010, I've been in a boat once for a research. That's it. Just one time.

And that's just the way my job has worked out. So I spent a lot of time at my laptop, behind a computer, doing analysis of data and those sorts of things. In, in in the office on land, which is why we bring all this information, data to us that we can then use and analyze here.

At our desks or at home, or wherever we are.

JANICE:

Great. Okay. The next question we have is from crypto crackers. Are there is a crypto crackers here. Can they nominate someone to ask the question that was predetermined here?

CONNER:

Yeah, I'm here.

JANICE:

Okay, great. Let's introduce yourself, please.

CONNER:

Okay. My name is Connor and I am 12 and I'm in seventh grade. I go to Murray Hill Middle School and I'm part of the crypto crackers.

And we have five people on our team. So the question we had was "what kind of code and parts do we need to build an underwater robot?"

MIKE

All right, I'll take that.

JANICE:

Yep.

MIKE:

All right. So, the different the different kinds of code in a glider navigation. So where is that glider going to fly to? Right. Is it what's it going to do underwater? Navigate underwater, navigate using satellites. So there's, there's navigation code then there's communications. When it comes to the surface. Right.

And it sends us that data. There's a communication link to satellite. So there's a communication code. They do data processing onboard the gliders too. So they showed you those instrument packages in the middle of the glider, and there's data that's processed on the glider before it gets sent to us. So there's. Right. So our navigation, data processing and communications, the last thing and the glider guys would tell you this is the most important thing for them is the engineering, right.

How is it working? Where is it swimming to? What's going on? You know, how is it diving? Is it going down too steep? Is it going down too shallow? How's it tilt, pitch and roll. Like an airplane flying through the air. Through the. This is through the ocean. Right. How's it? How's it navigating? So it's it's giving you information on how that glider is operating.

Most of the data are -*cough* sorry- Most of the code on the glider is written in C, so it's kind of all right. It's written in C, but that's what all the operations are. The plots of data behind you. Everything that we put online there I think I'm right in there saying this. Everything we put online is written in Python.

So Python, we've made that shift over the last several years. We used to use a lot of, Matlab, which costs, cost a lot of money. Pythons free. So and it's not just Rutgers. I mean, this is researchers throughout the world using Python to do their data analysis.

CONNER:

Excuse me. We didn't get to actually finish our question. We only said half of. That's for the crypto characters. But the other part. The other part of the questions like how many like what adjustments can we make to the robot if we're making.

MIKE:

I didn't hear it. The question,

JANICE:

can you repeat the question?

CONNER:

What adjustments can you make to the robot? If we change anything?

MIKE:

Well, once it's in the water, the only adjustments you can make are to how it flies right where it's going to, how it accesses data. So do I want to record, a temperature measurement once a second, once every five seconds, once every minute.

You can make those sorts of adjustments. How much data do I want to send back? Do I want to I know we don't usually send all the data. We send a we call it downsampled. So instead of every measurement, we might send every 10th measurement back to ourselves. Because it costs a lot of money to send data over satellite transmission.

So those are the those are the adjustments we can make on the fly while it's out in the water flying around. Thank you.

JANICE:

Okay. Our next question is from the CJHS Wildcats. There's someone here from Wildcats that wants to ask their question.

NALA:

Yeah, here we are.

JANICE:

Okay, great.

NALA:

Hi, I'm Nala, and I am in sixth grade at Central Junior High School. There are nine people on our team and our question is, what are some of the questions? What are some of the challenges our controllers face as they try maneuvering and collecting samples in difficult locations?

JANICE:

Excellent Question. We're going to send that one to Mike.

MIKE:

Okay. So up on screen now new picture. And I'm going to zoom in. So New Jersey's over here Long Island. And what you're seeing here are wind energy lease areas offshore. And I'm going to zoom in really really close. So we have, Martha's Vineyard, Nantucket, Rhode Island up here.

The tip of Long Island is right here, the very tip of Long Island. So it was zoomed in. These different big color marks are wind lease areas that they're going to be putting turbines in.

And the little dots are where they're planning to put turbines in these little blue dots, they're planning to put turbines in. the little green dots,

they have put turbines in. So what we had is you see this big spaghetti mess right here on top of this image. You can zoom in even more.

These are turbine turbine locations where they're planning to put them in, and they've done some work. We had a glider that swam around these turbines. We don't want to smash into a turbine. It's a big piece of steel. It wouldn't be good for the glider. So we have to navigate around them. And we're dealing with currents and tides and those sorts of things.

So we do all sorts of forecasts and models so we understand what the tides are and what the currents are while we're moving through. But other other challenges, shallow water is tough. The gliders can only go down to about 7 to 8m, is about as deep as shallow as we like to get into. At least here at Rutgers, a lot of other places they consider shallow, about 100m.

We consider shallow about seven meters because we have this big wide continental shelf. You know, it takes about 100 miles to go out to about 600ft depth. So it's it's shallow going out. So we have a lot of shallow shelf that we like to operate in. Other things that we've navigated around under, off of Maryland. They have these old tanks, World War Two tanks and old train cars from old subway systems in New York and in Washington.

And they they dumped them off shore to make reefs. So we actually had a glider fly into one of those, and it disappeared for about two and a half years. And then one day after a storm, it popped up, and we knew exactly where it was. We knew we messed up. We knew we flew the glider into this, probably was into a train car.

But the storm came through and mix up the water, and the glider popped up and washed up on shore. Two and a half years later. We also have to deal with, you guys, I don't know if you guys know what remora are. They're the little fish that that attach themselves to the bottom of sharks, and they clean the bottom of sharks, and they eat leftover pieces of food.

Well, those remora sometimes attach to the bottom of the glider thinking it's a shark. And that can be a problem because they're extra weight and the gliders are really sensitive to weight, and then they'll sink down. So we've we've had some challenges like that, but we also try to avoid being at the surface. That's that's probably the most important thing.

We don't want to stick around and be at the surface too long talking right via satellite. That's why we only send a little bit of data back. Is because when you're at the surface and there's boats at the surface going back and forth and shipping lanes, bam! We will not win if a tanker comes by and we've learned the hard way.

We learned lot about 14 years ago when a Kuwaiti tanker hit one of our gliders right off of Sandy Hook. The glider sank to the bottom. We were actually able to find it and and get get some pieces back. But, yeah, we we don't like to be at the surface because if a boat hits our glider, we're going to lose that.

That's that that that smack from the from the boats.

NALA:

Okay. And our next question is what are some of the challenges of conducting research at hydrothermal vents?

JANICE:

Okay. We have a related question. Let's see. There's one further down. I think that's from you, the Wildcats. Okay. So we're just asking them. Gotcha. Okay. Yeah. So couple of things about I'm going to address that one, a couple of things about, conducting research with hydrothermal vents that you have to deal with. One is, the extreme pressure, right.

As we get, further and further down in the water column, we get increased atmospheric pressure, and it builds and builds as you go deeper and deeper. So that puts a lot of strain and stress on, any kind of materials that you want to put down there, any kind of metals or whatever it can be really.

Can really, you know, respond to that pressure change and also the temperature differences. It gets really, really cold the deeper you get. And then of course, access to instruments becomes more challenging, right? The deeper you go, it becomes longer. It takes longer to get there. And the instrumentation, is affected by both the pressure and the, the temperature.

So those things combined can really make it challenging. There are some, ocean programs that are exploring how to overcome these kinds of challenges. The one that that we're all most familiar with is called the Ocean Observatory Initiative, or the OOI for short. And with the OOI, I'm going to share my screen really quick and, show you what what I can what I know about this, they have, they have some, instrumentation actually a cable that links, the coast off the coast of Washington state, out to these deep sea heights with thermal vents in the deepest parts of the ocean.

So what you're looking at is, a deep sea hydrothermal vent that's been, that has a video camera link to this cabled observatory, and they're taking video and still photographs, you know, periodically over time, this little clip is just, just happens to be what they have live on their website right now. They also have a video archive.

You can see all the time lapse videos that are available. So I encourage you to, to look at these Axial Seamount videos. Every so often they'll post new ones or or live stream what's going on at the vents. And it can be really interesting to see, what they're up to. So I'll go ahead and put this link in the chat.

But it is a very, very challenging place to work. But but one that that a lot of people are interested in, right. Because we want to see what's in the deepest ocean depths. So that was a really good question. Thank you for asking that one. All right. We're going to go back to the Teecs robotics club. They have they have a question as well.

Is there anyone here from t-e-e-c-s Robotics.

SRIHITH:

Yes.

JANICE:

Great. Let's hear from you. Introduce yourself.

SRIHITH:

my name is Srihith. And I'm, I'm, I'm third grade. And the question is how are marine biologists addressing ocean related challenges. If they use exploration vehicles, how are these vehicles designed, designed to withstand extreme pressure variations in the deep ocean?

JANICE:

Okay, excellent. I think we've got Mike on tap to answer that for you.

MIKE:

Yeah. So the the gliders originally had an aluminum hull right. That was that didn't what didn't give much much flex. So when the pressure came down right. It if there was any kind of offset in the hull right, they might start to leak because the glider is made up of pieces that are put together and there's Vaseline and then some rings, these, these rubber rings that are put in between you connect them and then you vacuum seal the glider, by the way.

So you suck all the air out of it and it's vacuum sealed. So it's there's no, no air inside the glider. But that hole, what they figured out is that it was too rigid, especially when you're going from the surface down to those great pressures. Right? You're going down to a 100 times our atmospheric pressure down at 1000m.

So what they did is they changed the carbon fiber. So the hull of the glider actually can compress and a little bit. Right. Not a lot, but it can compress a little bit. And that gives a little more flexibility. Also, I know there was a I remember there was a question about the outside of the hull, we, we put a coating on top of the hull that is that critters like, like algae and different things like that don't stick to that. Well, it takes them a little bit of time to stick to the outside of the hull, because we want to keep the hull clean as possible so that glider can slip through the water. The glider only moves at one kilometer an hour.

Right. It's it's really it's really slow. So anything we can do to reduce drag on the glider, we do so that that hull, that yellow hull that you saw in the lab, those parts are very, very smooth. There's a coating on the surface. So carbon fiber hull, smooth surface. And that's that carbon fiber allows that us to withstand those, those, you know, huge pressure differences on the, the bottom of the ocean.

SRIHITH:

Thank you.

JANICE:

Thanks, Mike. All right, next up is Potato Power. You guys have a question for us? Please introduce yourself.

NFORSHI:

Hi, I'm Nforshi from Potato Power. My our team is made up of seven members. The, from seventh to eighth grade. So our question is, hold on one second.

Our question is what tech method, what tech methods are currently used to monitor and predict severe conditions during ocean exploration? Or expeditions?

JANICE:

Okay, that's not the one we had on tap for you. Can you repeat that for us so we can rethink that?

NFORHSI:

We have, two different questions submitted. So I'll just say the original question.

JANICE:

Okay.

NFORSHI:

Okay. So our original question was for. Sorry.

JANICE:

It was about, the effectiveness decreasing after

NFORSHI:

the question was have you ever observed your equipment effectiveness is decreasing after exiting out of the ocean?

JANICE:

And I think Leah was going to help us out with that one.

LEAH:

That, You're good. You're okay. So our instruments are calibrated and so, like, they're essentially adjusted to fix some of the issues that happened when we retrieved them.

So sometimes we find that shark really attacks them, or like, we had, issue with a squid attacking the glider. So we have to kind of manage these different events and try to fix the glider. Sometimes there's leakages that happen within the glider, so we have to account for that as well when we send it back home.

And we had to, our engineers and some of our staff really work hard to fix some of those issues once we get the glider out, the water.

JANICE:

And what was the first one you said? Can you, can you reintroduce that other question you had? I didn't it cut out. I didn't hear the whole thing, but,

NFORSHI:

Our question was, what tech methods are used currently to monitor and predict severe conditions during ocean exploration? Or expeditions?

JANICE:

You mean in terms of weather and and predicting kind of how to plan the mission? Is that where you're you're thinking,

NFORSHI:

more of like, yes, in terms of weather, but also like, ocean currents and.

JANICE:

Yeah. Yeah. Okay.

So Mike, do you are you still there? Do you want to tap in a little bit to that with how you're using the how you program the gliders to, to go on different missions and what kind of adjustments you make based on the data you get back.

COACH ANITA:

Hi, Janice, this is, Coach Anita from Competitive Power.

If if I may add, right, like, the team is interested to know, like, if there is any real time adjustments that that are, that could be made, right as, as we collect the data, as the gliders collect the data about the harsh conditions, does it impact the exploration? And, if so, like what methods of technologies are in use?

To, navigate the glider. Right. During those harsh conditions.

JANICE:

Okay

MIKE:

so we the glider. Right, moves at one kilometer per hour, right? Really slow. So any current, and the ocean is going to steer that off, off kilter or off of our coast. The average current is about, well, ten centimeters a second. It's very slow.

But you go to other places in the world, like if you go that Gulfstream I showed you earlier that that red hot river running through the ocean off our coast that goes at about, four miles an hour. That's pretty fast. So, navigating through areas like that is difficult for a glider that goes so slow. So when it does come to the surface, if it's not in a place that that the pilot of the glider thought it should be, then they'll they'll put in a new point and say, okay, we need you to maybe go perpendicular to a current.

So if the currents going from, you know, down, down to up, right, we may want to try to cut straight across that, that current to get out of it. Occasionally, in fact, this just happened with a glider that we had in off new Jersey. We had some very strong winds offshore, for, a couple of weeks, actually, where our glider just kept blowing south, south, south, south, south.

And, we kept trying to fight going north. Eventually we, we got in shore close enough and they were able to maneuver back to go north. But that's why these things have long batteries. They're able to stay out long periods of time because occasionally things don't go the way we planned them, and the glider gets blown off course.

Other times we can do nice straight lines, but a lot of times you'll see squiggles and different things like that in the gliders because those currents, you know, occasionally get strong for a couple of days and then they calm down and they may get strong. So, we're able to, as they come up to the surface, tell them to do different things, adjust the way they're flying, or they can fly shallower.

Right. Slowly go down like this or fly deep, right. Real steep, depending on what type of, what's going on with the currents from top to bottom in the ocean. Does that answer your question?

COACH ANITA:

So does that mean the glider has to come to the surface, or do you use any technology to send communication to the glider? So in the example you have given, right. Do you use any technology for the glider to traverse north or.

MIKE:

No. The gliders, the gliders to talk to us have to come through the surface. We have experimented with having acoustic communications on buoys.

So the buoys always that, you know, the buoy always has an antenna at the surface, but at the bottom of the buoy and you go down the chain, there being a cable going down there on the, on the ocean floor, there'd be an acoustic sensor listening, and the glider could send a signal to that acoustic sensor without going to the surface.

Now that could happen. There are experiments with that, but we don't. That's not something we normally do. The gliders to talk to us have to come up to the surface to talk to us.

COACH ANITA:

Okay. Thank you. Yeah, that answers your question. Thank you.

JANICE:

Great. Okay. Next one up are the Five Handed Transformers. They have a question for us.

There's someone there from that team to read our question.

BEN:

Yes. I'm here.

JANICE:

Great. Introduce yourself please.

BEN:

So I'm Ben and I'm nine years old. And, we would like to ask that. We ask?

Give me a sec.

UNKNOWN VOICE:

Program is opening. Okay.

JANICE:

It's okay. Do you want me to read it for you? I can

BEN:

yes, please.

JANICE:

Yeah. Okay. What are some innovative solutions being deployed to clean up trash that ends up in the ocean before it ends up in the ocean? And I think we have Helena who's going to answer that for you? It's a good question.

HELENA:

Yeah, that is a great question.

So, personally, my favorite innovative solution to cleaning up trash is already been in the ocean is, Mr. Trash Wheel. If you haven't seen him, please search him up. He is so cute. He has his little eyes on him. But he's very famous tourist attraction in Baltimore, Maryland. And he's a trash interceptor. So he sits on the entrance of Jones Falls River as it empties into the inner harbor, and it picks up the trash as the water moves through it.

Also, there is there is clear bot, which is, an AI powered. They're AI powered self-driving vehicles that pick up trash on the surface of the water. So it can also pick up oil and invasive weeds as well. The ocean cleanup, which, we'll be sending a link to that as well. Yeah, so I love Mr. Trash Wheel, it is they are currently conducting the largest ocean cleanup in history.

So they use they are developing technologies and conducting and using them to do so. And then when it comes to before trash ends up in the ocean, it's important to acknowledge all the nonprofit organizations that conduct beach sweeps. So I don't know if any of you have been to one, but if you haven't, you can totally volunteer.

There are loads of nonprofits that conduct those, beach sweeps, some in New Jersey, which I know a lot of you are from, our Clean Ocean Action Save Coastal Wildlife and New Jersey Clean communities. So but I'm sure those of you out of state have a lot of, nonprofits that conduct beach sweeps as well. So, yeah, keep an eye out.

I hope that answers your question.

BEN:

Thanks.

JANICE:

Excellent. Okay. Next we're going to hear from the Lego Lords. Is there someone here that wants to ask those questions? We have actually two questions from Lego Lords. Come on up. Here they are. Introduce yourself. Please come up here. We're going.

MADDIE:

Hello, my name is Madd- Maddie, I am a I am from ICS and I'm part of the Lego Lords robotics team.

My question is, what are some obstacles related to wave energy? Are scientists working on making wave energy efficient to power our everyday life?

JANICE:

Great. Thank you Lego lords. Mike.

MIKE:

So, yes, there are, engineers that are working on that now. There's actually a company A here in new Jersey. Not far from here in Monroe called Ocean Power Technologies. You guys can look it up. They are the they are experts at this. And what they have is they have a, basically a a bui but it sits on this long cylinder, this long drum.

And as the boy is riding the waves going up and down, the drum kind of sits. And then there's this motion of going up and down, up and down. And that up and down generates electrical energy in this in the cylinder, we used it actually go about 15 years ago, and put one of our radar antennas on top of the buoy so it was able to be offshore, and be powered remotely by the cylinder under there.

So Ocean Power Technologies, there's a lot of different companies out there that do that sort of thing. But they're a company that we've worked with in the past that that, uses, wave energy.

JANICE:

Thanks, Mike. We have one more from Lego Lords. You guys want to read your second one?

NATALIA:

Yeah. Hello. My name is Natalia, and I am ten years old, and I'm part of the ICS Lego Lords team like robotics. And my question is, we've heard that offshore wind energy may be affecting whales near near new Jersey. How does this happen?

And has other marine life besides whales been affected by offshore wind energy?

JANICE:

Go ahead, Mike, it's all yours.

MIKE:

Right. So this one's a big, big topic for for me personally, everything that we have studied, all the data, information we have says that there is no impact to the whales from offshore wind energy. But I can tell you why the whales. Right. We've had this this last couple of years, big washups of different, different types of whales, mostly humpbacks, and young humpbacks that have come up, onshore. Requires a little bit, a little bit of explanation.

So. So bear with me for a second. So if you go, if you go back years ago, when I used to go out in the ocean, I'd go out, the 1997, 98, 99, 2000, 2001, I went out on about 60 cruises. I never saw a whale ever, in any of those cruises offshore. Now I'm told, and I told you, I don't go out in boats much anymore.

But now I'm told you have about a 50/50 shot on any time you go out for about 12 hours that you'll see a whale. The population of humpbacks has increased and this is a great thing. It's an absolute great thing that the population has bounced back. Another population that has bounced back is something called menhaden or bunker. They are fish.

There's an old growth old bunker fish processing plant down in Tuckerton, new Jersey. It's, now it's just an old archeological site because it's it was vacated about 30 years ago. And or maybe 40 years ago, they used to process catch bunker a lot on the Jersey shore. And then they started to kind of overfishing. So they backed off.

So that bunker fish has slowly grown and increased, increased, increased. And now there's a lot of them. And now it's actually become an annoyance for a lot of fishermen, because bunkers are not a fish that people eat much, when you catch them, they tend to decay quickly. They're very oily, so people don't really like them. Except if you're having they're used for, like, cat and dog food and stuff and and fish oil.

But, the bunkers tend to stay near shore. Now, the thing about bunker is that humpback whales love them. So what has been happening and what we've been seeing is a lot of the juvenile humpbacks are coming in closer to shore because the bunker are near shore. They tend to be near shore and in the estuaries, and they tend to be in shallow water.

So the whales come into the shallow water, these younger whales, and they're just opening up in shallow water. They get these schools of bunker and they go to town. It's like getting steak and gummy bears at the same time. Tastes great. A lot of protein for them. I'll put a little nope, someone's not muted. So it is a it's a great food source for them.

But the problem and now the problem is behind me, right. So here's a map behind me. Here's again, new Jersey hook. Oh, new Jersey, Long Island. What you're seeing here, the colors here, not these are the lease areas. These are where wind turbines are going to be installed over the next ten years. These little rectangles here off southern new Jersey, off of Nantucket and Martha's Vineyard.

But the solid image, these colors here, those are boat densities. Those are shipping lanes. There's a lot of density. And the reds in the yellows and the greens are more and more and more dense. So what you see is right along New Jersey, there are a lot of boats. And the fact New York is now the busiest port as of four years ago.

And this this, the is being hit and washing up on shore actually started in 2016. Not not last year, not two years ago. They really started being hit. So these, these, these humpback whales come in, they eat on the menhaden that are all in this area. Were all these boat these are these are basically highways offshore.

So they come in and they get hit by the boats in the shallow water. When I say boats, I mean a couple hundred feet long. And so they get hit and they get concussed or they get killed and then they wash up on shore. Another thing is whales that would wash up on the southern Jersey shore wouldn't come from right right here.

Remember I told you we had those surface current measurements we've been measuring for 20 years? Surface currents, for the most part, tend to go toward the southwest. So if something were to happen in one of these lease areas, they'd be floating down toward Delaware and Maryland. So odds are things that that whales that had washed up along the Jersey shore here probably came from being hit in these different areas here and it it stinks.

It just really stinks because the humpback population is really bouncing back. And the men, they come in and they get, they get an easy, easy meal with the menhaden, but the menhaden hang out in the shallow water in the shipping lanes. So that is what's happened.

We actually we had to put out a statement, about a year ago where we explain this, the whole situation, the whole offshore wind thing is a real sensitive topic.

A lot of people make their lives right. They're they're commercial fishermen. They have been fishing in these areas for years. And once wind turbines go go into these different blocks, they can't go and they can't do their commercial fishing in there. So it's it's going to affect their families, their lives, their, you know, their money. And, I totally get it.

But but that that's kind of a reality of of what's happening up here and up here. Right whales off of Nantucket, Martha's Vineyard, there's a lot of, right whales that come through that area at different times a year. And, the wind energy companies, when they're doing any work out there, are forced to put if they're doing the work to put in a pole, to put in a turbine, they put these bubble walls around the turbines because these they have these giant, giant circles of bubbles that come up and that interferes with the sound of the turbine being smashed into the water.

And it's it's an annoying sound. It's not going to kill the whales, but it's going to annoy them. So they might move away from an area, and, they have people on boats that are watching to see if there's any whales breaching. And as soon as these people on these boats see them, they have to stop any, any work that they're doing.

So we've been working a lot with the different groups, trying to help protect our environment from from what's happening. But, offshore wind is, certainly something that's going going to help alleviate a lot of the dependance on oil and fossil fuels and as we said early on, climate change, sea level rise, that's a big issue for us in the ocean.

JANICE:

Thanks, Mike. That's the end of the questions that we've prearranged to answer for you, based on the submissions from the form, I'm going to pass. Langston are there you've been monitoring the chat. We have enough time for maybe one more, maybe two more questions. Was there any that stood out to you, Langston, that you think the team can address?

LANGSTON:

There have been clear things that stood out to me. We are answering them as fast as we can, and chat I'm going to go and just look for it really quick to see if there are any questions that we weren't able to get to. You guys have been so, so wonderful up in the chat. We actually have a new one right here.

What are the most significant barriers that prevent effective government action against the disposal of plastics into the ocean, and what innovative policies could potentially overcome these obstacles? This was asked by [unintelligible] Whoever wants to take it.

AVYAN (?):

Hi, my name is Avyan (?). I'm in seventh grade and I'm 12 years old and my team is the Cyber Tigers. We have about five people and so we chose this question because we wanted to see what the government was doing.

So we said, what are the most significant barriers that prevent effective government action against the disposal of plastics into the ocean? And what innovative policies could potentially overcome these obstacles?

JANICE:

Yeah, this is a difficult, difficult question. And a difficult problem to solve because, as you know, there's basically nothing you can do in your life that doesn't involve plastic these days, right?

Everything from our clothes that we wear, plastic microfibers coming off of those to, you know, the plastic that we buy, the throwaway society that we're all living in right now of, of materials, not to mention the medical, industry. Right. That uses a lot of plastics and, and it's it's a really difficult problem, I think both, technologically to what do we use to replace those plastics now, knowing what we know about, you know, how prevalent they are in terms of microplastics and, and things of that sort.

And how do we how do we what what alternative actions can we take to replace plastics? And I don't think any of these questions are easy, right. Because a lot of times, you know, it involves getting a lot of people to make, big cultural shifts, as Mike talked about, you know, with money, right. It all comes down to finances and, and other solutions costing more money and sort of the, the balance of, of, action that has to be taken.

So I don't I don't have a specific answer to your question other than to say it is a really challenging one. And there are there are a lot of different players that have different investments. Right? The oil industry where all plastics are made from oil, we'd like everything to stay the same so they could make money.

And then, you know, there's others that are you know, we have quite a few people in this building who are asking a lot of questions about how microplastics build up in our physiology. You know, the microplastics. I've heard some estimates that say we eat a credit card worth of plastics in the food that we eat, you know, monthly.

So that that's a lot of plastic. Right? That ends up, bio accumulating in our body. So I don't have a good answer for you other than it's a real, really important issue and one that, you know, we're hoping our, our leaders and government will start to, pay attention to in the coming years as we try to address the climate crisis that that Mya and Leah told you about earlier in the program.

Does anyone want to add to that from the team?

Yeah, it's a lot of plastic.

AVYAN (?):

I have you said something about, like how humans eat a credit card worth of plastic. Yeah, but what do you think that can affect them? Because another one of the questions regarding microplastic in drinking water, what emerging research can you share about the less understood implications for human health?

JANICE:

Well, that's something that there are a lot of people studying right now.

I can tell you that there was a study that was just funded by the National Institute of Health to our medical school here. It at Rutgers, and it was a multimillion dollar study. I think it was like $20 million. They're going to be studying that over the next 20 years. And extremely, important thing to understand better.

I don't think there's any definitive answers yet on exactly what it does to us. I know that there was some, some researchers here who have studied it in terms of what it affects in terms of the reproductive abilities of fish. And, the answers are not good. You know, it does impact their reproduction, as Mya and Leah, we're talking about pretty significantly.

So I don't think I don't think, you know, it's good news, let's put it that way. But how how we start to mitigate that with a previous question is even more important right now that we know it's a problem. Anybody want to add to that? Mya? Leah? Anybody?

AYVAN (?):

Thank you.

JANICE:

Thanks. You're welcome. All right. Any other questions? Let's see. I see one hand raised. I see a couple coming in the chat. We don't have much time left. Langston.

MIKE:

Janice.

JANICE:

Langston and company. Go ahead and try to address the ones in the chat.

Who? Who just said that? Langston.

MIKE:

No, it was me. I was I was there were a couple of questions that came in over the weekend.

I was just going to.

JANICE:

Okay. Yeah, plow through them. Go ahead.

MIKE:

The people asked about the gliders and storms. I think Helena and Aiden may have answered this earlier, but, the gliders and storms, we try to get the gliders into the eyes of hurricanes, and we just had one in Hurricane Beryl. I think it was back in July down in the Caribbean.

The 47ft seas. Gliders don't complain. They don't get seasick, right? They don't throw up. They just do their thing and they swim through the ocean. Sometimes when the seas get really high, the tail that's got a stick out of the water and communicate to us. Sometimes we'll lose a little connectivity if there's a, like, major thunderstorm or something going through, but for the most part, they communicate to us and they just ride the waves.

So we try to get them out to hurricanes, we try to get them out to bad, bad weather because we're studying how, how the ocean, impacts the intensity of hurricanes. That was another question. So the heat in the ocean has a major impact. It is the driver of hurricane fuel. So we do a lot of studies using gliders in that we don't have to send people out in boats to get endangered and right into the ocean.

We send the gliders out.

JANICE:

All right. I think we have, I'm going to miss pronounce your name. Saish Naghul. You want to go first?

SAISH:

Yeah. Hi. I'm Saish. And my team is the Spill Spotters. And we consist of five team members. And, for our innovation project, the problem we were focusing on was all about oil spills. So we were just wondering, if you could tell us what advancements in remote sensing or, like, technology or like, satellite technology have, like, improved your ability to detect and track oil spills or such contaminants in the ocean.

And, how has this really changed your approach over the years?

JANICE:

Okay. Well, I don't know of anyone here at Rutgers that studies oil spills specifically, but Mike Crowley here is a remote sensing guru. So I'm going to let him tell you what he knows about that.

MIKE:

So, Saish, so satellite image satellite. Let's see, satellites look at little pieces of wavelengths of light so they'll break up light into, into channels.

So they may just look at one channel, may just look at a little piece of yellow. One may look at red. One may look at green light. 1st May look at infrared. One may look at longwave infrared which is actually temperature. So they sometimes are able to use those little channels and break them up so that they can actually separate oil from ocean water at the surface.

Another satellite that's used for oil spills is called synthetic aperture radar. And what happens when the oil hits the surface of the water? Little capillary waves, little tiny waves, like when the wind comes through, those get dulled down by the oil at the surface. So the radar as it's going overhead looks at that ocean surface roughness.

And you can actually see the ocean surface roughness be calm where the oil is. So they can map out the extent of oil. And they use that, for oil slick research for our gliders. Our only experience was, during, Deepwater Horizon. Back in 2010, or nine, ten, and we couldn't definitively say what we saw was oil, but there, Helena mentioned the eco park that looked at, looked at a little hockey puck that has little lasers, that looks at color like phytoplankton.

Well, that eco puck was on a couple of gliders we put down to that oil spill, and we we believe what we saw it was this slug of oil at about five, 5 to 700m down, well west of Florida. That was kind of it wasn't at the surface. It was a lot of it was kind of being, stuck down.

And we had our glider flying through there, but we were never able to definitively say, yes, that was the oil slick. It's just the colors that we saw were very indicative of that's probably what we were seeing. So that's, that's that's a little bit of our experience on the, on the satellite, a remote oil spill tech, technology.

SAISH:

All right. Thank you so much, Mike.

JANICE:

All right. I think we have time for one more question. I'm going to go with the Thunderbolts. I think that's the next one on my screen. That's up. So Thunderbolts, I. I yeah, but that night.

AGYA:

Yes. Thank you so much. My name is Agya [REDACTED] and I come from the team Thunder Bots. Our team is consisted of four girls through the grades the seventh and eighth.

And our innovation project is similar to your guys's gliders. And we wanted to make these little crawler capsules. That would kind of release off of our boats. And what I was having most trouble with was, you know, trying to figure out a material that would be durable for these capsules that we want to make. So we would like to one, we would like to ask, what materials you guys use for your gliders.

MIKE:

Well, I, I mentioned that the outer hull was carbon fiber. And then it's coated with this, anti they called anti biofouling. Basically spray that they seal it with. That's what they use for the gliders. Right. Because they're going down at this deep pressure I, I am not the engineer that builds the gliders. So the actual company that builds the gliders that we use is called Teledyne Webb.

And they, they're up.

AGYA:

What is it called.

MIKE:

Sorry.

AGYA:

What is it called?

MIKE:

Teledyne Webb. So Doug Webb is actually the guy that invented the glider. And Teledyne Webb is up in Falmouth, Massachusetts. And, they're the ones that build the gliders. And they, they are the engineers that know all the different pieces and how it's put together and all sorts of things.

Although we have a pretty good idea of how they're put together, but they're the ones that choose, the different, technology that goes into the glider of the hulls and how they're and plans, how they're going to be built.

AGYA:

Thank you so much, Mr. Crowley. We really appreciate it.

MIKE:

Yep.

JANICE:

I think that brings us to the end of our program. We it's it's just about 6:30. I hope you felt like you had a real world grounding today with all of our our speakers about ocean robotics and and how they impact the ocean and how we use them to study the ocean. So I think on behalf of the team, we wish you really good luck with your competition and encourage you to go to our website and social media to, to learn more about some of the research that we're doing.

Langston's putting that in the chat right in the right now. So the best of luck to everyone. And, we'll hopefully see you all, some other time. Thank you so much. Thanks for joining us.

ALL:

Thank you.