RIHANNA: You're listening to *Brains On!* where we're serious about being curious.

CREW: *Brains On!* is supported in part by a grant from the National Science Foundation.

MARC SANCHEZ: Beep, beep, beep, beep, beep, beep, beep, beep. Beep, beep, beep, beep, beep, beep, beep, beep. Slicing up the mango. Slice, slice, slice. Take a sniff of mango. Nice, nice, nice. Open the jar. Yeah, twist, twist. Hear the ocean water going swish, swish. Beep, beep, beep.

MOLLY BLOOM: Hey, Marc.

MARC SANCHEZ: Hey, Molly. Hey, Rihanna. I was just making myself a nice little pre-show snack. It's mango. Do you want some?

RIHANNA: Ooh, yes. I love mango. Thanks.

MARC SANCHEZ: Hold on. You're forgetting the most important step. Firmly grip your mango slice thusly. Mangoes are slippery little guys.

RIHANNA: OK.

MARC SANCHEZ: Now dip it ever so gently into this jar of ocean water.

RIHANNA: But why?

MARC SANCHEZ: Well, I think I was born with a little brine on the brain, so I consider myself something of a salt connoisseur. And the ocean has just the right level of salt. It's incredible. I don't know how that big body of water does it, but hats off to you, my wet friend. All right, grip, dip, and [EATING NOISES]

MOLLY BLOOM: OK then. Have a nice snack, Marc.

MARC SANCHEZ: Have a good show!

[THEME MUSIC]

MOLLY BLOOM: You're listening to *Brains On* from APM Studios. I'm Molly Bloom, and my co-host today is Rihanna from Irvine, California. Hi, Rihanna.

RIHANNA: Hi, Molly.

MOLLY BLOOM: So Rihanna, you live close to the ocean. What is your favorite thing about it?

RIHANNA: My favorite thing about the beach is the cool ocean salty water. I love to gaze at the water.

MOLLY BLOOM: Oh, very nice. Why do you like to look at the water?

RIHANNA: The water is very inspiring for me. It's beautiful.

MOLLY BLOOM: And do you like to play on the beach?

RIHANNA: I like to play on the beach and swim.

MOLLY BLOOM: Ah, nice. So when your swim--

RIHANNA: My dad taught me.

MOLLY BLOOM: Well, that's great. Do you like to swim in the ocean?

RIHANNA: Yes, of course. Yes.

MOLLY BLOOM: And so when you're swimming in the ocean, does some of that water ever get in your mouth?

RIHANNA: Yeah. Quite a lot.

MOLLY BLOOM: How would you describe the taste of it?

RIHANNA: Salt in the water tastes sour. There's a lot of salt.

MOLLY BLOOM: There is a lot of salt. And it is kind of like a sour taste. Do you like the taste?

RIHANNA: Yeah, sometimes.

MOLLY BLOOM: Yeah, it's a little too salty for me. I did not grow up near the ocean so I'm not used to it. I live in Minnesota. We do not have an ocean nearby, but we do have lots of lakes and they are not salty at all, so that brings us to this listener question.

CORINNE: Our question is--

SOPHIE: Why are oceans salty while lakes and rivers are not?

RIHANNA: That's Corrine and Sophie with what sounds like a simple question.

MOLLY BLOOM: And you'd think there would be a simple answer, but this is one of those times things are a little more complicated than you might think.

RIHANNA: Here to explain is Phoebe Lam.

PHOEBE LAM: I'm a chemical oceanographer at University of California, Santa Cruz.

MOLLY BLOOM: She studies what the ocean is made of.

RIHANNA: So exactly how salty is the ocean anyway?

PHOEBE LAM: The way they defined it originally was they would take a kilogram of seawater, and then they would evaporate it and they would measure what was left. And you'd get a pile of white powder at the end, and you weigh it. And that was how salinity was defined was the mass of dry solid in a kilogram of seawater.

RIHANNA: A kilogram of water is basically one big liter-sized bottle of soda.

MOLLY BLOOM: And salinity basically means how salty something is. So the higher the salinity of the water, the more salty it is.

RIHANNA: So what is the saltiness or salinity of seawater?

PHOEBE LAM: Seawater has a salinity of what we call 35 parts per thousand, and that means you take a kilogram of seawater, you end up with 35 grams of solid stuff. Most of it would be sodium and chloride, but there are other things.

MOLLY BLOOM: So out of that liter or big soda bottles worth of saltwater, there's about 3 tablespoons of salt. Size wise, about as big as a medium egg. A very salty egg.

RIHANNA: It turns out there are many kinds of salt.

MOLLY BLOOM: The majority of the salt in the ocean is sodium chloride, which is the same as table salt.

RIHANNA: But there are also a bunch of other salts made from other minerals too.

PHOEBE LAM: Magnesium and sulfate and calcium and potassium and all sorts of other elements.

MOLLY BLOOM: So when you taste sea salt-- salt that's actually been harvested from seawater-- it has some of these other elements in it, which gives it a slightly more bitter taste than regular old table salt that's just sodium chloride or maybe a little sour, like Rihanna said earlier. Some people even prefer the sea salt taste, like Marc.

MARC SANCHEZ: You guys are doing a great job.

RIHANNA: Speaking of Marc.

MARC SANCHEZ: We just need to pause for a quick message from chemistry.

MOLLY BLOOM: A message from chemistry?

MARC SANCHEZ: Yeah, chemistry is going to explain how the ocean is just, well, chemistry. Stand by.

[MUSIC PLAYING]

CHEMISTRY: Oh, hi. I didn't see you there. I am Chemistry. We've just met, so please allow me to introduce myself. I'm the study of stuff or matter and how stuff interacts with other stuff. Composition, combination, transformation. it's fun. One of my very favorite substances is water, also known as good old H20. And this beautiful glass I'm holding is full of a solution. Not a solution that solves a problem, unless that problem is thirst.

In chemistry, a solution is a word we use for a mixture of substances. Substances meeting, dissolving appearing as one. In this case, the solution in my glass is made of water and a gas called carbon dioxide. That gas is perfectly spread out in my water so you get the same crisp taste in every sip.

Ah, refreshing. The seltzer, fizzy, sparkling, bubbly water, LaCroix, whatever you want to call it, is a solution. And our wet and wavy friend the ocean is also a solution. That means it has salt dissolved and evenly spread throughout its water. Ah, that's me, Chemistry. You're welcome.

MOLLY BLOOM: That was not what I was expecting Chemistry to sound like.

MARC SANCHEZ: What a delight.

CREW: (SINGING) Ba, ba, ba, ba, ba, ba, ba, ba, ba, ba, ba, ba, ba,*Brains On!*

RIHANNA: So we have all these salts dissolved or mixed into in the ocean making a solution of salt water. But how do the salts get there in the first place?

MOLLY BLOOM: Did a salt meteor from space crash in the ocean?

RIHANNA: Did pirates spill all their cooking salt?

MOLLY BLOOM: Did the fish all cry and cry salty tears until the ocean was a big salty soup? Here's Phoebe again.

PHOEBE LAM: All of the saltiness in the ocean got there from rivers. And you would probably ask, well, rivers aren't salty.

MOLLY BLOOM: Exactly. That's what Corinne and Sophie want to know.

CORINNE: Why are oceans salty while lakes and rivers are not?

RIHANNA: Actually, rivers and lakes do have salt in them. Just very little. It's not enough for us to notice.

MOLLY BLOOM: Soil and rocks near lakes and rivers break down over time or erode.

RIHANNA: And when they do, little pieces of these rocks wash into the lakes and rivers.

MOLLY BLOOM: These tiny bits of soil and rock are made of things called minerals, and salt is just a type of mineral. Many of these small chunks of rock and soil break apart and make salt.

RIHANNA: Lakes are different than the ocean in an important way. Lakes have outlets or places where the water escapes like a river that flows away from the lake.

MOLLY BLOOM: Even if you can't see a big river or a stream coming off a lake, there are still outlets. And these outlets eventually lead to rivers. And these rivers lead to the ocean.

RIHANNA: The ocean is kind of like a big lake but with no outlet. Stuff flows in, but nothing flows out.

MOLLY BLOOM: But even though water is constantly flowing into the ocean from rivers, the ocean isn't getting bigger and bigger every day.

RIHANNA: That's because the ocean is also losing water through evaporation. And when water evaporates off the ocean, it leaves the salt behind.

CHEMISTRY: Did someone say evaporation? Hi, it's me, Chemistry, again. Ah, evaporation. What a delicious word. That's when something changes from a liquid to a gas. In this case, water. When liquid water molecules heat up, they evaporate becoming a gas. Salt, however, can't turn into a gas so easily, so it stays behind. So over time, the ocean loses water but keeps the salt.

CREW: It's a crystal.

CHEMISTRY: So it gets saltier over time. This is how not-very-salty water from rivers becomes salty, salty ocean water. Evaporation. You're welcome.

MOLLY BLOOM: Thank you? There are actually a handful of lakes with no outlets too. And guess what? They are also salty. If you're ever in Utah, check out the Great Salt Lake. The name kind of says it all.

RIHANNA: This leads to the next question. If these salts keep getting left behind in the ocean, why isn't it getting saltier and saltier all the time until eventually it's nothing but salt and we have to surf on salt lakes and swim through salt and--

MOLLY BLOOM: Whoa, whoa. Don't worry. The salts have a way of leaving the water.

PHOEBE LAM: So the salts are coming in but they're also being removed from mineral precipitation.

MOLLY BLOOM: If only we had a jazzy way of talking about precipitation.

CHEMISTRY: It's me, Chemistry, and I have a treat for you. Precipitation. Precipitation. Mm, mm. That's when a substance comes out of a solution. It says, bye bye. I don't want to be mixed up with you anymore. It would be like if the chocolate in your chocolate milk suddenly clumped together and turned back into a chocolate bar leaving the milk white and creamy again. Don't worry, that won't happen with your drink. But it does happen with air.

Air, that gorgeous gas we breathe in and out. That's a solution too. Up in the sky, water molecules and other gases all come together to form a solution of air. But the water can precipitate out, becoming a liquid again and fall into the Earth. We call it rain. [LAUGHS] So any substance in a solution can precipitate out. I'm looking at you, salt. Oh, and you're looking at me? Hello. Do you like what you see? You're welcome.

RIHANNA: Thanks?

MOLLY BLOOM: So yes, usually we hear the word precipitation and think rain. Water on land evaporates and becomes rain clouds. Then the water falls from the clouds as droplets. It turns out salts do something similar. The salt in the water forms back into solid minerals and becomes like a tiny rock or a speck of sand again.

RIHANNA: Some of these minerals that precipitate out fall to the ocean floor, sort of like rain falling out of the sky. And these minerals end up forming sedimentary rocks like gypsum.

MOLLY BLOOM: That's the main component in sheet rock, the stuff that makes the walls in your house or school.

RIHANNA: So in a way, your home may have been formed by this ocean cycle.

MOLLY BLOOM: This underwater precipitation helps the ocean keep its salty balance so it's not too salty. There are slight differences in salt level in different parts of the ocean. Some spots in the Atlantic are as high as 37 parts per thousand, and some areas of the Pacific can be as low as 32 parts per thousand.

RIHANNA: But the average is 35 parts per thousand, and it's been that way for millions of years.

CREW: *Brains On!* On, on.

MOLLY BLOOM: There are lots of other things that help keep this special balance of saltiness going. Water evaporates. Non-salty freshwater flows in from rivers or falls down in rain. New minerals come in through these rivers and through underwater openings in the seafloor called hydrothermal vents. In fact, hydrothermal vents are also one of the ways salt leaves the ocean. More on hydrothermal vents later in the show.

RIHANNA: The ocean is the sort of complicated machine that somehow always manages to balance out how salty it is.

PHOEBE LAM: I teach it in my graduate chemical oceanography class, so it does end up being a little bit more complicated.

RIHANNA: So I figured the best way to talk about this super complicated thing is to write a song.

PHOEBE LAM: Oh cool, that's awesome.

RIHANNA: Right? It's called *The Salty Sea Shanty.*

MOLLY BLOOM: But before that salty song, it's time for some natural noises to knock on your eardrums. It's time for the--

RIHANNA: Mystery sound.

MOLLY BLOOM: You ready, Rihanna?

RIHANNA: Yeah.

MOLLY BLOOM: All right, here it is.

[ELECTRIC WHIRRING]

MOLLY BLOOM: What do you think? What is your guess?

RIHANNA: It sounds like a printer.

MOLLY BLOOM: Mm.

RIHANNA: Yeah.

MOLLY BLOOM: Thinking a printer. All right, we're going to hear it again a little later and give you another chance to guess and find out the answer after the credits.

[THEME MUSIC]

RIHANNA: We're working on an episode all about stress, and we want to hear from you.

MOLLY BLOOM: We want to know what does your body feel like when you're stressed out? Rihanna, what does stress feel like in your body?

RIHANNA: When I'm stressed, I feel like my body's about to explode.

MOLLY BLOOM: Oh yeah, I know that feeling. And so when you do have that feeling, what helps you feel better?

RIHANNA: And to make me feel better I pop a pop-it and I play my favorite games.

MOLLY BLOOM: What is a pop-it?

RIHANNA: It's like a stress toy.

MOLLY BLOOM: Does it kind of look like little bubbles you're supposed to press?

RIHANNA: Yeah, that thing.

MOLLY BLOOM: I'll have to try that when I'm feeling stressed out next time. Record your answer and send it to us at BrainsOn.org/Contact. And if you have any other questions, mystery sounds, high fives, or drawings you'd like to share with us, you can send those to us at BrainsOn.org/Contact too.

RIHANNA: That's where we got this question.

[? LISA: ?] My name is [? Lisa. ?] And my question is, why do dog chase their tails?

MOLLY BLOOM: You can hear an answer to that question on our *Moment Of Um* podcast. It's a short daily dose of facts that comes out every weekday. Find the podcast wherever you listen to *Brains On.*

RIHANNA: Search for *Moments Of Um.*

[MUSIC PLAYING]

RIHANNA: You're listening to *Brains On* from APM Studios. I'm Rihanna.

MOLLY BLOOM: And I'm Molly.

RIHANNA: And now here it is, the song we've all been waiting for, *The Salty Sea Shanty.*

[MUSIC - "THE SALTY SEA SHANTY"]

CREW: (SINGING) Oh, rocks erode and minerals flow to the ocean where they have nowhere to go. These minerals stay dissolved in the sea where they taste salty to you and to me. But the ocean has found a balance so sweet, 35 parts per thousand salinity.

A balance just right. We all give a cheer. 35 parts or swimmingly near. 35 parts or swimmingly near. 35, shout the waves, the fish, and the shore. 35 is the number that we're going for. 35 parts, say the kelp and the rock. 35 parts per thousand is so good to us.

As new salts flow in, other salts leave. Precipitating so they can be rocks once more, sedimentary. Evaporates like gypsum come out to the sea. Atlantic, Pacific, Indian too. These oceans make up a great salty stew. Their waters will find a way to maintain 35 parts. It all stays the same. 35 parts. It all stays the same. 35, shout the waves, the fish, and the shore. 35 is the number that we are going for. 35 parts say the kelp and the rocks. 35 parts per thousand is so good to us.

MOLLY BLOOM: We have a music video for this song at our website featuring drawings by you, our listeners. Head to BrainsOn.org to check it out. Now we're going to travel to the silent depths of the ocean. Hydrothermal vents, also known as underwater hot springs, are super fascinating and also very important in helping minerals come in and out of the ocean. These events occur where there are underwater volcanoes. Seawater goes down into the crust and is heated up by very hot magma. That's rock that's so hot it's actually a liquid.

DEBORAH KELLEY: Over 70% of the volcanic activity on Earth occurs underwater, but most people don't know it because they never get to see it.

MOLLY BLOOM: That's oceanographer Deborah Kelley from the University of Washington. These vents are referred to as black smokers because they're basically chimneys that spew out superheated water.

RIHANNA: The water coming out of the vents looks like black smoke because it contains fine mineral particles making it darker than the water around it. Deborah has traveled deep underwater in a small submarine to study these vents up close.

DEBORAH KELLEY: It's one of the most fantastic things I've ever done. I always-- I've been down more than 50 times, and I would drop anything usually to go down there. And the first 300 feet or so or more are kind of sunlit because the light penetrates, and then you go into complete darkness.

And a lot of the organisms are bioluminescent so they, so to speak, glow in the dark. And the vehicle is dark inside and you can put your face up against the window, and it looks like you're falling through the stars. Almost every time we go down there, we see something new or you know that you're the first human eyes to ever, ever see that.

MOLLY BLOOM: Scientists have learned a lot from these underwater hot springs, but we didn't even know they existed until about 50 years ago.

RIHANNA: Part of what makes them so amazing is that even though they are in total darkness, there are cool and strange creatures that live there.

MOLLY BLOOM: These strange creatures of the deep have lots of cool superpowers too.

RIHANNA: They can actually filter toxic metals out of the water.

MOLLY BLOOM: Mining companies are using them to clean water. Scientists are working to see if these organisms could be used to capture carbon dioxide from the air or possibly even develop new medicines.

RIHANNA: Deborah Kelley ended up in this field by accident, but she's very excited about all there is to learn in the future.

DEBORAH KELLEY: You know, when I was growing up, it's the whole-- I wasn't the smartest kid. I worked hard, but I always thought that discoveries were for somebody else, right? And right now in oceanography, the oceans really govern the health of our planet. And I think understanding not only the hot springs but the oceans that we live in is going to be more and more critical. And as kids come up through K-12 and into college, this is one of the areas where there's a potential for a really huge discoveries. And many of them, not just a couple. The ocean really is the last frontier on Earth.

[MUSIC PLAYING]

MOLLY BLOOM: Now, Rihanna, we've been hunting down the answer to Corinne and Sophie's question about why the ocean is salty, but you also wrote to us with your own question about the ocean floor. You wanted to know what it's made of. So what got you interested in this?

RIHANNA: At school, I had to do research about famous women leaders. I was very interested in the life of Marie Tharp. She was a geologist, and she made the first map of the ocean floor. She discovered that it was not flat. I think this is very cool, so I wanted to know what the seafloor was made of. I love that she compared the ocean floor to a fascinating jigsaw puzzle to piece together.

MOLLY BLOOM: That is really, really cool. Yeah, Marie Tharp is very, very inspiring. Do you like to solve puzzles too?

RIHANNA: Oh, of course I do.

MOLLY BLOOM: So when you read about Marie Tharp, did you kind of see some of your own interests in her?

RIHANNA: Oh yeah. Yeah, definitely.

MOLLY BLOOM: Yeah, Marie Tharp's work is super inspiring and even more so because she did it at a time when women were told that they shouldn't go into men's fields like physics and geology.

[MUSIC PLAYING]

Marie finished college right before World War II. When the United States joined this war, a lot of men were asked to leave behind their schooling and jobs to help fight. Women who stayed home were asked to fill in for the men. For Marie Tharp, that meant studying geology, something usually only men were encouraged to do.

She got a master's degree and eventually a job in the field, but there were still doors that were closed to her. She worked for a group studying the ocean floor and was told women weren't allowed to go on the ships that were collecting the data. But that didn't stop Marie from making a huge contribution to our understanding of the world.

She took all the data from these ships and pieced it together into a detailed map of the ocean floor all by hand, without computers or cameras. And what she mapped blew her mind. She found a 10,000 mile long ridge in the middle of the Atlantic Ocean-- basically an underwater mountain range. People had thought the ocean floor was flat but it wasn't. This ridge meant that the ocean floor was spreading, that there were plates on the surface of the Earth slowly moving, causing volcanoes and earthquakes.

This idea is called plate tectonics, and it was new at the time. When she brought this to the men she worked with, they dismissed it as girl talk. But eventually, given all the data, they accepted it. Scientists today are still inspired by Marie Tharp's work. In Katie Kelley's lab at the University of Rhode Island, she has copies of Marie's maps hanging on the walls.

KATIE KELLEY: The map that she made was a huge transformation for understanding the geology of planet Earth because if you've seen her map, you know that what it did is it basically peeled away the ocean layer so that you can see what the ocean floor looks like. And it's really, really different from what the rocks look like on land. And that was one of the major keys for understanding the plate tectonic model, which is how we describe the geology of planet Earth.

RIHANNA: Whoa.

MOLLY BLOOM: Yeah, very cool. Let's pretend there was some kind of amazing suit you could wear where you could start on the beach and just kind of keep walking and it would like anchor you to the floor, like what that journey would be like.

KATIE KELLEY: Right. So in the really near-shore environment you'd have wave action working on your body, right? If you've done swimming at the beach you know what that feels like. And you'd be able to see in the water, right? It would have this beautiful blue color. You'd potentially be able to see fish and the mud and rocks on the ocean bottom.

But as you walk out deeper and deeper, the light goes away. And that's one of the things that makes Marie Tharp's map actually really incredible is that we can't see the ocean bottom. It was very hard to make that map because light can't get down there. So as the light fades away, it gets darker and darker. And then as you continue to walk out, it's actually a pretty shallow-- really shallow slope actually. It will take you a long time to get into very deep ocean water.

But then you'll come to this place called the shelf break, and it's a very steep slope then. It takes you down into the abyss until you'll get deeper much faster if you keep walking. And so it's mostly sand, mud all the way out until you get close to the peak of a mid-ocean ridge.

And then the rocks will change because there will be lava flows covering the sea floor instead of this mud because you get closer to the zone where active volcanoes are very continuously spitting out lava flows. And so the sediment doesn't have a chance to pile up there because it's continually resurfaced through volcanic activity.

RIHANNA: Thanks, Katie. You're really smart. Thanks for answering my questions.

KATIE KELLEY: Well, thank you, Rihanna. It was a real pleasure talking with you. Good luck.

[MUSIC PLAYING]

RIHANNA: The ocean is salty thanks to chemistry.

CHEMISTRY: You're welcome.

MOLLY BLOOM: Rivers carries salts into the ocean from soil and rocks breaking apart.

RIHANNA: Ocean water evaporates leaving salt behind.

MOLLY BLOOM: But eventually, some of this salt leaves the water to become solid again so the balance of salt in the water is always about 35 parts per thousand.

RIHANNA: Hydrothermal vents are an important part of the cycle.

MOLLY BLOOM: They sit on the ocean floor where there's a lot of volcanic activity.

RIHANNA: Marie Tharp mapped the ocean floor, leaving us to understand that the surface of our planet is made up of plates.

MOLLY BLOOM: That's it for this episode of *Brains On!*

RIHANNA: This episode was produced by Molly Bloom, Anna Goldfield, Ruby Guthrie, Marc Sanchez, and Nico Wisler.

MOLLY BLOOM: Our editors are Shahla Farzan and Sanden Totten. And our executive producer is Beth Perlman. We had engineering help from Kevin Stockdale, Jess Berg, and Derek Ramirez. Special thanks to Eric Ringham, Rania [? Maatouk, ?] and [? Hussein ?] [? Makki. ?] The executives in charge of APM Studios are Chandra Kavati, Joanne Griffith, and Alex Schaffert.

RIHANNA: *Brains On!* is a nonprofit public media program. There are lots of ways you can support the show.

MOLLY BLOOM: Head to BrainsOn.org. There you can donate, check out our merch, buy our book, or listen to past episodes.

RIHANNA: And tell your friends about us. If you like*Brains On!,* they'll probably like it too.

MOLLY BLOOM: OK, Rihanna, you ready to go back to that mystery sound?

RIHANNA: Yes.

MOLLY BLOOM: All right, let's hear it again.

[ELECTRIC WHIRRING]

Yeah, what do you think now?

RIHANNA: I think it's like a remote controlled car.

MOLLY BLOOM: Ooh, I can totally hear that. Yes, because it kind of like stops and starts.

RIHANNA: Remote controlled something with a motor.

MOLLY BLOOM: Oh, a motor for sure. All right, you ready to hear the answer?

RIHANNA: Yes.

MOLLY BLOOM: All right, here is Quinn from Houston, Texas with the answer.

QUINN: That was the sound of a pencil being sharpened. Thank you. Bye.

RIHANNA: Oh my god.

MOLLY BLOOM: [LAUGHS] OK, yeah. So a pencil being sharpened. But it had a motor in there to make the sharpener go. It's one of those automatic ones. Have you used an automatic pencil sharpener before?

RIHANNA: Only at school. Yeah.

MOLLY BLOOM: Yeah, it's a tricky one. But it totally sounds like a remote controlled car to me too. That was a good guess.

RIHANNA: That was amazing.

MOLLY BLOOM: It was amazing.

CREW: Brains, brains, brains.

MOLLY BLOOM: Now it's time for the brain's honor roll. These are the incredible listeners who keep this show going with their questions, ideas, mystery sounds, drawings, and high fives. Kabi from Charlotte, North Carolina. Miriam, Rachel, and Samuel from Montreal. Quincy from Brooklyn, New York. Iris and Henry from Seattle. Della and Imani from Stone Mountain, Georgia. Etta from Yosemite Valley, California. Scarlett from Topeka, Kansas. Kasia from Kansas City. Belle from Wisconsin. Lochlan, Lincoln, Fisher, and Finnegan from Topton, Pennsylvania.

Nora from Shelton, Connecticut. Uma from Minneapolis. Beau from Stratford, Connecticut. Emerson from Boston. Charlie from Freeport, Maine. Athen from North Bend, Washington. Camille from Dallas. Heinrich from Ottawa. Anna and Grace from Abbotsford, British Columbia. Kyra from the Philippines.

Rushaan from Washington DC. Nath from Indiana. Caleb and Audrey from Burlington, Ontario. Mariam from Scottsdale, Arizona. Iliana from Loretto, Minnesota. Collette from Cambridge, Massachusetts. Vivi from Alta, Illinois. Caroline from Anchorage, Alaska. James and Sarah from South Jordan, Utah. Sophia from Waltham, Massachusetts.

Freya from Verdun, Quebec. Anderson and Sawyer from Excelsior, Minnesota. Owen from Columbus, Ohio. Natalie from Boulder, Colorado. Nico from Salt Lake City. Christopher from Kent. Sophia from Syracuse, New York. Annali and Sadie from Paso, Texas. Rihanna from Irvine, California. Maria from Burnaby, British Columbia.

Dev from West Pennant Hills, Australia. Elena from Corbin, Kentucky. Henry from Melbourne, Australia. Luke from Greenland, New Hampshire. Nyara from Navarre, Florida. Clark and Nora from San Antonio, Texas. Eva from Port Laoise, Ireland. Audrey from Farmington, Arkansas. Mateus from Maryland. Ephraim from Abington, Pennsylvania.

Nico and Benji from Galesburg, Illinois. Josiah and Seth from Sheboygan, Wisconsin. Julian from Santa Clara, California. Isaac from Williamston, Michigan. Sam from Los Angeles. Petra from Canada. Soraya, Asha, and Sonia from Chicago. Amog from Oxford, Mississippi. Olivia from Biggleswade, England. Owen from Asheville, North Carolina.

Aeya from Dubai. Keena from California. Nicholas from Kentucky. Freya from Edmonds, Washington. Opal from Chicago. Vishal from Calgary. Anna from Dayton, Ohio. May-Louise and Maxine from Lathrop, California. Mia from Mississauga, Ontario. Noalani from Cypress, Texas. And Emmy and Mira from South Pasadena, California.

CREW: *Brains On!* Bye-bye.

MOLLY BLOOM: We'll be back next week with more answers to your questions.

RIHANNA: Thanks for listening.