

INTERVIEWER You're listening to Brains On, where we're serious about being curious.

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INTERVIEWER Brains On is supported in part by a grant from the National Science Foundation.

2:

[MUSIC PLAYING]

SANDEN This is the life. Fruity tropical juice with a little umbrella in it. Soft, beachy sand under my toes. Gentle ocean breeze ruffling my hair.

MARC You said it, buddy. It's about time we took a vacation. But remind me again, why do we have to come out here in the middle of the night?

SANDEN If we come to the beach at night, we don't need sunscreen. Think of all the time and money we're saving if we don't need to slather ourselves with thick goopy sunscreen every few hours. It's got to be hundreds, no thousands of dollars.

MARC I guess so?

SANCHEZ:

SANDEN And there are no crowds at night. Just you, me, and that eerie glowing seawater out there.

TOTTEN:

MARC Sanden?

SANCHEZ:

SANDEN Yeah, Marc?

TOTTEN:

MARC Do you know why the seawater is glowing?

SANCHEZ:

SANDEN It's probably just mermaids with flashlights having a dance party. Or fish aliens. Oh, no, no, no. Fish ghosts.

TOTTEN: That's why they're glowing.

MARC Hold on. I've read about this. There are teeny tiny creatures in seawater called plankton, and sometimes they can make blue green light. It's not fish ghosts.

SANDEN Speaking of fish ghosts, I have the most brilliant idea. Hear me out. We should make a multimillion dollar feature film about two long lost fish lovers whose families refuse to recognize their relationship, so they have to reunite as fish ghosts.

MARC OK. That sounds awesome. But the glowing fish water really is from plankton. I mean, I read about it--

SANCHEZ:

SANDEN And it's got to be the most epic fish love story ever told. We'll call it Mackerel and Bear-Culiet. Marc, quick, write
TOTTEN: this down. Mackerel, mackerel, wherefore art thou Mackerel?

[MUSIC PLAYING]

MOLLY BLOOM: You're listening to Brains On from APM Studios. I'm Molly Bloom, and my co-host today is Avika from Dallas, Texas. Hi, Avika.

Avika: Hey, Molly.

MOLLY BLOOM: Today, we're talking about how some creatures in nature have a very special ability. They can literally make their own light. It's called bioluminescence. Think twinkling fireflies, glimmering glow worms, or the dangling light attached to an anglerfish. And it's something a lot of you have questions about.

LUCAS: Hi, my name is Lucas. I'm from Maryland. And my question is, how many bioluminescent species are out there, and what makes them glow?

ELLIOT: Hi, my name is Elliot and I live in Hamilton, Massachusetts why are some animals bioluminescent.

BRIDGET: Hi, my name's Bridget, and I live in Toronto. Why do fireflies glow? And why is it green? Or does it change color?

MOLLY BLOOM: We're going to get to all your questions. But first, Avika, have you ever seen different animals glowing in the wild?

Avika: I have. So I have seen a bunch of fireflies, and I think they're super cool. I have done the thing where you put the fireflies in the jar. And that's one of my favorite activities. That's really, really fun.

MOLLY BLOOM: That's very cool. I'm very jealous, because I've actually never seen a firefly in real life.

Avika: Really? Oh my gosh.

MOLLY BLOOM: Yeah. It seems very magical, though. So would you want to glow if you could?

Avika: Yes. Oh my gosh, yes. That would be so cool. You'd be like a living glow stick.

MOLLY BLOOM: What part of your body would you want to make glow?

Avika: Probably my hands. I don't know, I feel like my hands would look really cool glowing because it would look like I have superpowers or something.

MOLLY BLOOM: Yes. That would be awesome. I'm thinking I would like my eyes to glow.

Avika: That would be so cool. You would look like you had laser eyes.

MOLLY BLOOM: Totally. It's really impractical. It'd probably hurt. I don't know if the glowing eyeballs, yeah, would get in the way of me seeing things. Maybe I should make my eyebrows glow instead. Maybe that's the better thing to have glow.

Avika: I feel like there's got to be some complication with your sight with glowing eyeballs. So I think you should do the glowing eyebrows. And you really could freak people out with glowing eyebrows.

MOLLY BLOOM: It could be like a fashion statement, really.

Avika: Yeah, you really could, yeah, just start a new trend.

MOLLY BLOOM: OK, I'm in. Let's do it.

Avika: Woo!

MOLLY BLOOM: So what would you use your glowing hands for?

Avika: So sometimes we have the occasional power outage here in Texas. So I think that's what I would use them for. Because that gets really annoying if it's really dark. So I can actually see stuff without having to use lanterns or flashlights. It's a lot easier.

MOLLY BLOOM: Yeah. And hands, that's a very practical choice, because if you're cooking, you could see what you're doing with your hands. Like writing, all of that. That's very smart. So bioluminescence looks almost like magic. But it's actually chemistry. In nature, creatures use chemical reactions inside their bodies to make light.

Avika: It starts with a chemical called luciferin. It means "light bearer" in Latin.

MOLLY BLOOM: Some animals can make their own luciferin, but others can't. So they have to eat other bioluminescent animals to get this chemical. Some fish, for instance, eat tiny glowing shrimp and then soak up their luciferin.

Avika: And once they have this chemical, all their body needs to do is to mix it with oxygen to make light.

[DINGING]

MOLLY BLOOM: Lots of animals also use a special enzyme called luciferase to help them glow.

Avika: These enzymes are microscopic proteins that fit together with the luciferin chemical. It's like putting two puzzle pieces together or sticking a key in a lock.

MOLLY BLOOM: And once the chemical and the enzyme are connected, it makes that reaction go even faster.

[DINGING]

Which makes more light.

Avika: Lots of different creatures are able to glow, like fish, mushrooms, and even some bacteria.

MOLLY BLOOM: But if you're like Avika, the bioluminescent animal you're probably most familiar with is the firefly.

[MUSIC PLAYING]

Fireflies aren't actually flies.

Avika: Yeah, they're beetles. But we call them fireflies because they fly and make these spectacular light shows across North and South America and parts of Asia. They're like nature's fireworks.

MOLLY BLOOM: To make light, fireflies have special organs on their butts loaded with the luciferin chemical and its matching enzymes. By controlling how much oxygen goes to this system, they can decide when to light up.

Avika: And that's important because fireflies flash in very specific patterns. It's how they find mates.

MOLLY BLOOM: Male fireflies flit around in the air looking for a female. And while they're flying, they're also flashing. Like putting up a big blinking sign saying, hey female fireflies, check me out.

MALE FIREFLY: OK, deep breaths.

[BREATHING HEAVILY]

It's time to put yourself out there, just like Mom said. Here goes.

[RINGS]

Avika: And then a female firefly sees the male's signal and flashes back to him in the same pattern.

FEMALE Ooh, he's new. Hey, over here.

FIREFLY:

[RINGS]

MOLLY BLOOM: There are a bunch of different firefly species out there, and each one has its own special flash pattern. It's like a language, but with light. But here's the really cool thing. Some female fireflies will actually mimic the flash signals of other firefly species. And when the male flies over to her, she'll eat him.

[CHOMPS]

Avika: Whoa, that's intense.

MOLLY BLOOM: I know. We'll talk more about other reasons why animals glow in just a bit. But first, let's talk about how many can do this and where they live.

Avika: There are a lot of bioluminescent creatures living on land like fireflies. But almost all of the bioluminescence on Earth actually happens in the ocean.

MOLLY BLOOM: Scientists aren't sure exactly how many different sea creatures are able to glow. But it's a lot.

EDIE WIDDER: If you drag a net through the water almost anywhere in the world, most of the animals you bring up in that net make light. And in many places, it's 75%. In some places, it's more than 90% of the animals make light.

Avika: That's Edie Widder.

EDIE WIDDER: I am the CEO and senior scientist of the Ocean Research and Conservation Association and have spent most of my career as a deep sea explorer.

MOLLY BLOOM: Edie studies the creatures that live in the deepest parts of the ocean. And that means she's spent a lot of time underwater. Once, she got into a special deep sea diving suit and was lowered into the ocean off the coast of California.

EDIE WIDDER: And my very first dive, it was a late evening dive in the Santa Barbara Channel. And I went down to 800 feet, which was an astonishing depth for somebody that had never been deeper than 90 feet.

Avika: Edie also dives underwater in submersibles that can descend thousands of feet below the surface.

MOLLY BLOOM: Submersibles sometimes look like big clear beach balls that you can sit inside. Only the plastic has to be really thick so it doesn't collapse underwater. And Edie says as you go deeper, it gets darker and darker.

Avika: Eventually the color disappears completely, and it's just this dim gray light. And you start around you seeing sparks of luminescence. And if you activate the thrusters, which are the little propellers on the side of the suit that you fly it with, this swirling vortex of neon blue light swishes up out of the thrusters with sparks, blue sparks mixed in. It looks just like when you throw a log on a campfire and the embers swirl up off the campfire. Only these are icy blue embers.

MOLLY BLOOM: All of those sparks and flashes are tiny bioluminescent creatures in the ocean, like plankton.

Avika: It's like a big underwater light show. But Edie says that there are lots of other, much bigger sea creatures that make their own light, too.

MOLLY BLOOM: Well, if the best place to learn about bioluminescence is the ocean, why don't we just go there?

Avika: Yeah, beach trip. I've got my sunglasses, my beach towel, my scuba gear.

MOLLY BLOOM: Oh, you won't need a scuba suit. We can just hop in the EXPLORER.

Avika: The EXPLORER?

MOLLY BLOOM: Yeah. The Extremely Practical Land and Ocean Rover Exploring Remote Realms. We keep it parked in the back of the studio.

[ENGINE REVVING]

Avika: It just looks like a blue minivan with flames on the side.

MOLLY BLOOM: I know. But the EXPLORER is so much more than that. It can take us from the highest mountain peaks to the deepest depths of the ocean. And it even has a recording studio on board.

Avika: Is that a taco shaped button?

MOLLY BLOOM: Oh, yeah. Marc added that so we can eat tacos any time we want.

[CRUNCHES]

OK. EXPLORER, take us to the bottom of the ocean.

Whoa. Edie was right. It really is dark down here.

Avika: Totally. But do you see those glowing dots over there? Maybe it's an anglerfish. Or an eel. Or even a--

OCTOPUS: Hello.

[YELLS]

MOLLY BLOOM: Oh, phew. It's just an octopus.

OCTOPUS: I'm not just an octopus, I'm a glowing sucker octopus.

Avika: Cool. But why are you glowing?

OCTOPUS: Shh! I'm luring prey.

MOLLY BLOOM: What prey?

OCTOPUS: I eat copepods, which are these tiny, teeny little crustaceans that swim in the water. They're like the insects of the ocean. But I need to eat a lot of them to feel full. Like a lot.

Avika: So where does the bioluminescence come in?

OCTOPUS: Watch this. I just flip upside down--

And spread out my body to make this big balloon shape. Then I twinkle my glowing suckers, which attracts the copepods.

COPEPODS: Wow, look at that beautiful glowing light. Let's go check it out. It's gorgeous.

I want to touch it. It's beautiful.

OCTOPUS: And then once the copepods are all inside, I smoosh up my arms and I suck them into my mouth.

[SLURPS]

Bioluminescence is an amazing way to lure in your dinner. It worked on you, didn't it?

MOLLY BLOOM: Oh, yeah. Wait, does that mean you're going to eat us?

OCTOPUS: Oh, no. I'm strictly a pescatarian. Just seafood for this sea fella.

Avika: That's a relief. But some sea creatures also use bioluminescence for other stuff, like finding mates.

MOLLY BLOOM: Yeah. Just like the fireflies we were talking about earlier. A really good example of this is the lantern fish. The lantern fish looks like a regular fish with its big eyes and shiny scales. But what makes it special is the light it makes to find other lantern fish in the inky darkness of the ocean.

[PLINKING]

Avika: I think I see some way over there in the distance. Look at those glowing little orbs. I see blue and green, and now yellow. Their lights come in so many different colors.

MOLLY BLOOM: Male and female lantern fish have glowing blue green lights all along the sides of their bodies in different patterns. Scientists think the different light patterns might help lantern fishes find a mate of the same species in the darkness.

Avika: So bioluminescence can help animals find food and mates. But I've also heard that it can be used for camouflage.

MOLLY BLOOM: I wonder how glowing in the dark would help a fish hide.

SHARK: It depends on where you're looking.

MOLLY BLOOM: Oh my gosh, it's a shark.

Avika: It's OK, Molly. It's a cookie cutter shark. It's two feet long.

MOLLY BLOOM: Two feet of tiny terror? Why didn't I see you anyway?

SHARK: Because I was glowing. Or more accurately, my belly was glowing. In the deep ocean, the brightest light comes from above. So when I light up my belly, I can blend in with the natural light.

MOLLY BLOOM: Wait, you're glowing so we can't see you? That doesn't make any sense.

SHARK: Sure, it does. Because my belly is glowing, I won't create a silhouette. If you look up, it just looks like naturally occurring light. When really--

Avika: It's you.

SHARK: Exactly. It's called counterillumination. A lot of different sea creatures use it to stay out of sight and hide from predators. It's pretty cool.

Avika: Wow. There are so many ways to use bioluminescence.

MOLLY BLOOM: Yeah. Animals use it for luring prey, communicating. Even camouflage.

Avika: There are probably even more ways animals use bioluminescence.

MOLLY BLOOM: Let's go find some.

Avika: You sure love to learn, Molly.

MOLLY BLOOM: That, and we're out of tacos.

[BUBBLING]

PAULY PONTIAC: Hey. Polly Pontiac here. You probably recognize me as the owner, proprietor, and general genius behind the most prosperous and prominent used car dealership in Hoboken, New Jersey, Pauly's Preferred Pontiacs. But what you probably don't know is that I'm also an expert on bioluminescence.

[BOUNCE SOUND]

That's right, folks. I'm just gaga for glowing animals. And I'm here to convince you why they're so awesome. Here's a bioluminescence fact to illuminate your world. In the 1800s, some coal miners used jars of fireflies and even glowing fish scales for light down in the mines. This was before electric lights were common. And miners couldn't use torches or candles because sometimes there's natural gas leaking out in the mines. And fires would make it explode.

[EXPLOSION]

So remember, the next time you're looking for a bioluminescence history lesson or a 1991 two door coupe with titanium alloy wheels, come on down to Pauly's Preferred Pontiacs.

MOLLY BLOOM: We're going to find out more about bioluminescence in a bit. But first, it's time for the mystery sound.

AUDIO TRACK: Mystery sound.

MOLLY BLOOM: Here it is.

[DRIPPING]

[FLUSHING SOUND]

I have no idea what this is either. Avika, what is your guess?

Avika: I don't know. I mean, so obviously there's some kind of liquid here. So it sounds like a toilet, honestly. Like--

MOLLY BLOOM: Yeah, that's what I was thinking.

Avika: Yeah, it sounds like some kind of pipe sucking up water. But I'm completely not sure. I think that's as far as I know right now.

MOLLY BLOOM: Yeah, I definitely heard water in there, for sure. How do you usually do with the mystery sound, Avika? Do you usually get it right?

Avika: No. I usually get it-- I think 99.999% of the time I get it wrong unless it's very, very obvious or it's a sound I've just heard.

MOLLY BLOOM: OK, we'll see if we can break the streak today. We will listen again and have another chance to guess after the credits.

[MUSIC PLAYING]

Hey, friends. We're working on an episode all about friendship.

Avika: Friendship is an incredible part of being a human.

MOLLY BLOOM: But that doesn't mean it's always easy. So listeners, we want to hear from you. Have you ever had questions about making friends or how to deal with tough friendship situations? Avika, have you ever had a problem with a friend that you didn't know how to solve right away?

Avika: Definitely. So one of my friends was really down in the dumps. So all of my friends were trying to cheer her up. But I made a joke and I offended another friend, so it kind of--

MOLLY BLOOM: Oh, no.

Avika: --tangled web of offending and sadness. It was not very fun.

MOLLY BLOOM: So how did you get out of that web?

Avika: So the friend who was sad at first, she actually just had some really bad allergies, so she was just tired. But she was fine. The friend I offended, we just left her alone for a while. And she was OK. So everything worked out.

MOLLY BLOOM: That is great. Yeah, sometimes space is the best answer, and allergy medication.

Avika: Yeah.

MOLLY BLOOM: So do you have any advice for other kids who might be dealing with some friendship issues?

Avika: Well, now I feel like space and allergy medicine would be some very good advice. But definitely space. If someone doesn't want to talk, you'll probably be able to tell, especially if you know them well. Then don't bother them. And talk to them when you know they are OK to talk.

MOLLY BLOOM: Very good advice. And listeners, we want to hear from you. Tell us, what makes a good friend? Record your thoughts. We'll be featuring some of your answers on this upcoming episode.

Avika: Send them to us at brainson.org/contact.

MOLLY BLOOM: And while you're there, you can send us mystery sounds, drawings, and questions.

Avika: Like this one.

SUBJECT: Why did snakes lose their legs?

MOLLY BLOOM: Again, that's brainson.org/contact.

Avika: And keep listening.

[MUSIC PLAYING]

PAULY Pauly Pontiac back again with Pauly's bioluminescence effects to light up your life.

PONTIAC:

[SHINE SOUND]

OK, the name's a work in progress. But you get the idea.

PETER Pauly, Pauly. You seen my socket wrench?

PONTIAC:

PAULY Pops, I'm doing a bioluminescence commercial over here.

PONTIAC:

PETER Oh, sorry. Can I be in the commercial? You know how much I love glowing animals.

PONTIAC:

PAULY Yeah, pops. It would literally make my day. Let's hear your best bioluminescence fact.

PONTIAC:

PETER I'm Peter Pontiac, New Jersey's used car salesman of the year since 1982. And also Pauly's dad. Hey, here's a twinkling little tidbit of history for you. Did you know that Japanese soldiers in World War II used bioluminescent crustaceans called ostracods, also known as sea fireflies, for light?

PAULY Yeah. Ostracods look like big sesame seeds. And when you mash them up into a paste and mix them with water, they glow. The light was bright enough for soldiers to read maps and notes. But not too bright to give away their position.

PETER And even today, almost 80 years later, if you crush up dried ostracods from World War II, they still make light.
PONTIAC: OK, son. I really got to find that wrench. I got a pickup truck out there that sounds like a pack of raccoons fighting over a hoagie on the 4th of July.

PAULY Pops, it's right there hanging from your belt loop. And this has been Pauly's bioluminescence facts to light up your life.
PONTIAC:

[CAR HORN]

[VOCALIZING]

AUDIO TRACK: Brains On.

MOLLY BLOOM: This is Brains On. I'm Molly.

Avika: And I'm Avika. Humans have been fascinated with bioluminescence for thousands of years. But these days, scientists are finding new ways to use it in technology.

MOLLY BLOOM: That's right. Here's our ocean explorer friend, Edie Widder, again.

EDIE WIDDER: The chemicals extracted from bioluminescent animals have proved enormously valuable to science. And we have not begun to extract all of them yet. But they are opening up a whole new world of cell biology. So one of them extracted from a bioluminescent jellyfish, the chemical's called green fluorescent protein.

MOLLY BLOOM: Green fluorescent protein is just what it sounds like-- a protein that glows.

Avika: Yeah. And it really changed how we study some things in science.

MOLLY BLOOM: Scientists wanted to know how jellyfish bodies make that glowing protein, so they looked at the animal's genetic instructions. Those are like the blueprints the body uses to make stuff. Then they found the part of the instructions used to make the glowing jellyfish protein.

Avika: And once they figured that out, they could recreate the genetic instructions and put it in different cells. You know, the building blocks of all living things. So this meant they could make glow in the dark cells.

MOLLY BLOOM: These special glowing cells have helped scientists study all different kinds of things, like how animal brains work or how plants grow.

Avika: Green fluorescent protein was an amazing and important scientific discovery. But there are lots of other cool things that scientists are doing with chemicals taken from bioluminescent creatures.

MOLLY BLOOM: Like in medical research. We talked with Benadette Khufari, who is working on treatments for cancer.

BENADETTE KHUFARIin My name is Benadette Khufari, and I'm currently a research associate at the Yale School of Medicine.

MOLLY BLOOM: Benadette is using the same special chemicals and enzymes that animals use to create bioluminescence in nature.

Avika: Right. The luciferin chemical and its matching enzyme. Like what fireflies use. But she's doing all of this in a lab.

MOLLY BLOOM: Benadette and her team are using bioluminescence to understand how cancer grows and spreads and to see how well the medicines they're developing to fight it are working.

Avika: Right now, they're testing the system on mice.

MOLLY BLOOM: Benadette adds the luciferase enzyme to a cancer cell in a mouse so that just like in a firefly, the cell will light up when oxygen and luciferin are added.

BENADETTE And then that reaction will produce light. That light is how I can use a machine to track the light and get a nice
KHUFARI: picture.

MOLLY BLOOM: The glowing will give her a picture of the size and growth of the cancer cells. She can measure the light to see if they're getting bigger or smaller. Or if they're spreading to other places in the body. Benadette says it's like putting a little GPS tracker on the cell.

Avika: It also lets her see whether the cancer starts to shrink when it's treated with medicine.

BENADETTE You can really get a nice picture and see, OK, is that signal, that light signal, is that going down after two or three
KHUFARI: weeks of my treatment or whatever it is? Or is it staying the same?

MOLLY BLOOM: If it's going less and less, that means the tumor is shrinking and the medicine is working. You can also add the luciferase enzyme to medicine so that researchers can make sure that medicine is going to the right spot in the body.

Avika: That's important because medicine can't do its job if it takes a detour to somewhere else in our body.

BENADETTE Hypothetically, if we want to develop a medication that can be used to treat kidney disease. And then after we
KHUFARI: give it to a mouse, we can see, is it really going to the kidneys?

Avika: Bioluminescent technology is also being used by researchers working to find treatments for other medical conditions.

MOLLY BLOOM: Some scientists are even using bioluminescence to measure ocean health. Since so many of the creatures in the ocean are able to glow, scientists can track how well populations are doing just by measuring the light.

Avika: There's also a company in France working on designing bioluminescent streetlights and billboards for eco-friendly lighting that doesn't use fossil fuels. And there are probably lots of other applications that we haven't even thought of yet.

AUDIO TRACK: Brains On. On. On.
[MUSIC PLAYING]

PAULY Pauly Pontiac here. Number one used car salesman in Northeastern New Jersey and number one bioluminescence
PONTIAC: expert. With me today is my brother from another mother, Tommy, who also happens to be--

PAULY AND Gaga for glowing animals.
TOMMY:

TOMMY: That's right, Pauly. Not only do we want to get you behind the wheel of this slightly used 1978 station wagon with realistic faux wood paneling, we also want to get you to know about the wonders of bioluminescence.

PAULY
PONTIAC: Tommy, did you know that bioluminescent creatures have inspired myths and legends around the world? Like in Japan, legend has it that fireflies are the tears of a beautiful moon princess.

TOMMY: And in North America, colonists believed that glowing bitter oyster mushrooms were actually fairy lights that would lead people astray in the forest.

PAULY
PONTIAC: Or in Greece, sailors thought the bioluminescent ocean waves were the hands of the sea god Poseidon guiding their ships. But it wasn't a god, it was something even better.

PAULY AND
TOMMY: Bioluminescent plankton.

PAULY
PONTIAC: I get so worked up talking about bioluminescence. All right, Tommy, it's time to get back to selling these high quality use cars. Like this one right here. It's called the Explorer. This one of a kind machine can handle extreme pressure, extreme temperatures, and extreme elevation.

TOMMY: And it even has a taco button.

Delicious.

PAULY
PONTIAC: The EXPLORER can be yours for the low, low price of \$1,099. Cha-ching. No credit needed.

MOLLY BLOOM: Paul-- Mr. Pontiac? No, Mr.-- No!

Avika: Wait!

[MUSIC PLAYING]

MOLLY BLOOM: Lots of different creatures make their own light using special chemical reactions inside their bodies.

Avika: Scientists aren't exactly sure how many bioluminescent species are out there. But they think most animals in the ocean are able to glow.

MOLLY BLOOM: Animals use bioluminescence for all different kinds of things, like escaping predators, luring in food, and even finding mates.

Avika: And it's also become an important research tool that scientists are using to study cancer, monitor the health of our oceans, and lots of other stuff.

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

Avika: This episode was produced by Shahla Farzan, Aaron Wallace Lassie, Nico Gonzalez Wisler, Molly Bloom, Anna Weggel, Rosie DuPont, Anna Goldfield, Ruby Guthrie, and Marc Sanchez.

MOLLY BLOOM: This episode was edited by Sanden Totten, sound design by Rachel Breeze. And we had engineering help from Jackson Wistorff, Alex Simpson, and Jess Berg. Beth Perlman is our executive producer. The executives in charge of APM Studios are Chandra Kavati, Alex Shaffert, and Joanne Griffith. Special thanks to Manish Jain and Vishali Jain, Stewie Bloom, and Brant Miller.

Avika: Brains On is a nonprofit public radio program.

MOLLY BLOOM: There are lots of ways to support the show. Head to brainson.org.

Avika: While you're there, you can subscribe to our Smarty Pass, which lets you listen to ad free episodes and other super special bonus content.

MOLLY BLOOM: And you can submit your questions and fan art. We love getting fan art from you. It makes our days.

OK, Avika, are you ready to hear that mystery sound again?

Avika: Of course.

[DRIPPING]

[WATER FLUSHING]

MOLLY BLOOM: OK. Any new thoughts?

Avika: I don't know. It sounds like someone dropping something into some body of water and then that body of water being flushed or sucked into a pipe.

MOLLY BLOOM: Now let's think. What body of water would be near a pipe? Let's get specific.

Avika: I guess, I mean, it depends. Because I don't know what a sewer sounds like. But I don't think it sounds like a sewer. I'm not sure. But I mean--

MOLLY BLOOM: Do we think it's inside or outside?

Avika: Inside, because there's this echoey noise. You can tell the sound is bouncing off the walls. If it was outside, there probably wouldn't be that noise, so.

MOLLY BLOOM: Very good guess. And here is the answer.

MEREDITH: Hi, I'm Meredith from Mountain View, California. And that was the sound of my bathtub drain.

Avika: A bathtub--

MOLLY BLOOM: OK, I'm going to give you at least 50% credit on this, if not 75%. Because you got indoor body of water. And let's face it, how many of those are there in the world?

Avika: I guess that's true, but-- and now that makes so much more sense now that I know what it is. Because I've heard the sound of a bathtub drain before.

MOLLY BLOOM: Yes. And it was tricky, because it was like-- it didn't go all the way at first, right? It was like picking up the drain and putting it back down. I'm giving you partial credit, for sure.

Avika: Yay.

[DRIPPING]

[WATER FLUSHING]

MOLLY BLOOM: Now it's time for the Brains Honor Roll. These are the incredible kids who keep the show going with questions, ideas, and mystery sounds, drawings, and high fives.

[LISTING HONOR ROLL]

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

Avika: Thanks for listening.