Brains On (APM) | Brains On! Dolphins vs Octopuses: Showdown in the sea! 1QDE6ERFPQAT5DHNR4TP0PM4RM

ADELINE: You're listening to *BrainsOn,* where we're serious about being curious.*BrainsOn* is supported in part by a grant from the National Science Foundation.

[FOOTSTEPS]

MOLLY BLOOM: Oh man, I am so excited. Only five minutes until showtime.

ADELINE: I can't wait.

MOLLY BLOOM: Let's tell the gang it's almost time to get started.

[KNOCKS ON DOOR]

[DOOR OPENS]

ADELINE: Dolphin?

DOLPHIN: Yes?

ADELINE: Sanden?

SANDEN TOTTEN: Present.

ADELINE: Five minutes until showtime.

SANDEN TOTTEN: Five-- OK. Five minutes. Phew. Oh boy, oh boy, oh boy, oh boy. OK Dolphin, we got this.

DOLPHIN: Yeah, we do.

SANDEN TOTTEN: All right. OK. Let's do this one for all the mammals out there. You ready, Dolphin?

DOLPHIN: Yeah!

SANDEN TOTTEN: All right. We're going to go, Team Dolphin on 3. 1, 2, 3-- Team Dolphin!

[DOLPHIN SQUEAL]

[DOOR CLOSES, FOOTSTEPS]

ADELINE: They are pumped up!

This is going to be a great debate.

[KNOCKS ON DOOR]

MOLLY BLOOM: Marc?

MARC SANCHEZ: Yep?

MOLLY BLOOM: Octopus?

OCTOPUS: Uh-huh?

MOLLY BLOOM: Just letting you know, five minutes until show time.

MARC SANCHEZ: Oh man. OK. Deep breaths. Deep breath in--

[INHALES]

OCTOPUS: Deep breath out.

[EXHALES]

MARC SANCHEZ: Deep breath in.

[INHALES]

OCTOPUS: Deep breath out.

[EXHALES]

MARC SANCHEZ: We are ready.

OCTOPUS: We have never been more ready.

MARC SANCHEZ: High fives, octopus.

[TENTACLES SLAPPING]

That's right. All eight of them.

OCTOPUS: Oh yeah. Up top. Down low. To the side. Too slow. Just kidding. You're not too slow.

MOLLY BLOOM: This could take a while.

OCTOPUS: Yeah. OK. Down--

ADELINE: We should take our places too.

MOLLY BLOOM: Right.

ADELINE: Let's go.

[UPBEAT MUSIC]

MOLLY BLOOM: You're listening to *Brains On* from American Public Media. I'm Molly Bloom, and today is the day. It's time for Dolphins versus Octopuses. Two clever creatures of the sea-- one a mammal, one a cephalopod-- both super cool. But which is cooler? Here to help us judge is Adeline from Raleigh, North Carolina. Hi, Adeline.

ADELINE: Hi.

MOLLY BLOOM: So Adeline, you are the one who sent us this debate suggestion. So what made you think of this match-up?

ADELINE: I don't know. I just like dolphins, and I like octopus.

MOLLY BLOOM: What is your favorite thing about dolphins?

ADELINE: I think it's just cool that-- how they jump up in the air, and how they're not shy when humans are around.

MOLLY BLOOM: And what's your favorite thing about octopuses?

ADELINE: Their camouflage.

MOLLY BLOOM: Mm. So are you starting out-- do you think more on one side or the other? Are you right down the middle?

ADELINE: Hm. Probably right down the middle.

MOLLY BLOOM: Well, I think Adeline is the perfect person to judge this debate today. We asked our listeners to weigh in on which they think is cooler, and here's what they had to say.

[UPBEAT MUSIC]

ZARA: I think dolphins are better because they are very curious, and can even swim up to a boat. They're also really cute and are mammals, so they're a lot smarter than octopuses.

MASSIMO: I think octopuses are better than dolphins because they are super intelligent, have multiple arms, and squirt ink. And dolphins do not.

MADISON: I'm Team Dolphin because dolphins are mammals, and I'm a mammal. So I think it's pretty cool to be related to a dolphin.

SLOAN: I'm Team Octopus because this-- I was at the Vancouver Aquarium. One of the people who works there was trying to clean the tank of the giant Pacific octopus. The octopus-- she was not having it. She grabbed the cleaning brush with her tentacles, and yanked it right out of the man's hands.

MOLLY BLOOM: That was Zara from Las Vegas, Massimo from Philadelphia, Madison from Manassas, Virginia, and Sloan from Vancouver. We'll hear some more dolphin and octopus arguments from our listeners later in the show, but now it's time to get this debate started. Here to represent Team Octopus is *Brains On* producer, Marc Sanchez.

MARC SANCHEZ: Hey Molly. Hey Adeline.

ADELINE: Hi.

MOLLY BLOOM: And here, fighting for Team Dolphin is *Brains On* producer, Sanden Totten.

SANDEN TOTTEN: Hey everybody. And a special shout out to all our underwater listeners. We know you're there. Thank you.

MOLLY BLOOM: All right. Adeline, we'll be asking you to score each round. There's going to be some tough decisions and some close calls, but we know you will be a fair and impartial judge. And listeners, you can score along as well. In fact, if you download the Leela Kids app-- that's L-E-E-L-A Kids app-- you can vote in our poll while listening. Look for the vote button. Or you can vote at brainson.org. We want to hear who you think is the winner too. We did a coin toss before the show, and Mark will be starting off with his opening statement.

MARC SANCHEZ: Thanks, Adeline and Molly. And thank you, Sanden, for giving me the chance to talk about one of the world's most interesting creatures. Now I know people think dolphins are cute with their perma-smiles and happy-sounding chirps, but what's below the surface? Octopuses are beautiful inside and out. With the best camouflage in the animal world, their bodies are like pieces of artwork-- a reflection of the magnificence of the ocean. Octopuses have multiple independent brains. And who doesn't love independence?

Unfortunately, while preparing for today's debate, I ran into a slight problem. Octopuses are so cool I don't have time to tell you everything. Did you know they have actual blue blood? Blue blood! And if they lose an arm, they can just regrow it. Oh, and they swim using jet propulsion. True. Friends, the facts are undeniable. Team Octopus will be the clear winner in today's debate. Thank you.

MOLLY BLOOM: Nicely done. Sanden, it's your turn.

SANDEN TOTTEN: Dear listener, you should choose dolphins because they're a lot like us. They're mammals. They're warm-blooded. They breathe air. And yet, they live in the ocean. How? How do they do that? Well, dolphins are marvels of specialized evolution. You see, they evolved from hooved land animals that return to the sea around 50 million years ago. Since then, their noses evolved to move to the top of their head to become blowholes. That helps them breathe really quickly while they're skimming the surface of the water. They developed the ability to hold their breath for 10 minutes at a time--

[INHALES]

--which is--

[PUFFS AIR]

--way longer than I can hold my breath. Their front legs grew into flippers. Their back legs disappeared. And their tails turned into powerful flukes. And if this sounds all crazy and alien to you, don't let the differences fool you. Deep down, dolphins are a lot like us. They have strong family ties. They like to play and have fun. And they're smart. And since you're smart too, I know you'll choose Team Dolphin for the win.

MOLLY BLOOM: Very persuasive, Sandin. Now Adeline, I don't want you to say it out loud, but I want you to think about who had the most compelling opening statement, and then give them a point. Have you made your decision?

ADELINE: Yep.

MOLLY BLOOM: OK.

[LAUGHTER]

MARC SANCHEZ: Very secretive.

MOLLY BLOOM: Now we're moving on to round 1. Sanden, take it away.

SANDEN TOTTEN: A lot's been said about how cute dolphins are, but come on. It's hard not to feel pure joy when you see them-- those squeaky voices and the knowing smiles. They're like nature's antidepressant. But dolphins are more than just a pretty face. They're also--

(ECHOING) --lean, mean swimming machines.

[ENGINE REVS, ROCK MUSIC]

AIDEN: Hi, my name is Aiden, and I am from Grainger, Indiana. And my question is how fast can dolphins swim? Thank you.

[ENGINE REVS, ROCK MUSIC]

SANDEN TOTTEN: Well, Aiden, some species have been clocked swimming over 35 miles per hour-- way faster than humans can run. How do they do it? It's all about those flukes. The flukes act like wings that create lift with a flapping movement. Dolphins flap their flukes, but instead of an upward lift, it creates forward motion-- zoom! And dolphins are epic jumpers too.

[WATER SPLASHES]

[PERFORMANCE MUSIC]

They can leap out of the water, some as high as 20 or 30 feet. That's like-- imagine you being able to jump onto the roof of a two-story house. It's incredible.

[SONAR BEEPING]

One of the coolest talents dolphins possess is the ability to see sounds using clicks and whistles.

[DOLPHINS CLICKING, WHISTLING]

We call this echolocation. And it's vital for navigating the ocean since water can be murky and hard to see through. But sounds pass just fine. Our listeners are naturally super curious about this.

KIERA GARFIELD: My name is Kiera Garfield, and I'm from Hawaii. How do Dolphins whistle and click

STELLA: Hi, I'm Stella. And my question is, how do dolphins make the clicks and whistles that they use to find food and communicate?

[DOLPHINS CLICKING, WHISTLING]

SANDEN TOTTEN: Denise Herzing is the research director of the Wild Dolphin Project in Jupiter, Florida. She says these sounds start in the dolphin's blowhole.

DENISE HERZING: They have four different air sacs, so think of it as four balloons in there. And they basically can open and shut that opening to pass air, past this little flapping valve, so it's like--

[TRILLS LIPS]

And if it goes fast enough, it makes a bunch of clicks, or it might turn into a whistle or other sounds.

[DOLPHINS CLICKING, WHISTLING]

And then what happens is the sound is projected through that bulbous part of the head you see, which is basically in front of the braincase. It's this fatty structure. And it focuses the sound like a flashlight would focus light.

[DOLPHINS CLICKING, WHISTLING]

SANDEN TOTTEN: Then that beam travels in a sound wave through the water.

[SONAR BEEPING]

If there's something in the way, the sound bounces off that object, and is sent back to the dolphin-- like how when you shout at a canyon.

(ECHOING) Go Dolphins!

Your voice bounces off the distant walls, and comes back as an echo.

(ECHOING) Go Dolphins! Go Dolphins! Go Dolphins! Dolphins pick up these underwater echoes through their lower jaw. The jaw channels the sound into an inner ear that sends a signal to the brain, where it's interpreted as maybe-- hey, there's a school of tasty fish ahead, or watch out, shark!

Echolocation is sensitive enough that dolphins can tell the difference between a BB pellet and a kernel of corn from 50 feet away. Plus, echolocation can penetrate soft structures like sand, letting dolphins have an almost X-ray-like vision in some cases. They could just echolocate and find fish that are trying to hide. It's a pretty cool power, but it's not their only superpower. They also heal like Wolverine from the *X-Men.*

MICHAEL ZASLOFF: Even more amazing than Wolverine, absolutely.

SANDEN TOTTEN: Meet Michael Zasloff, a professor at Georgetown University's School of Medicine. He says, imagine, if you will, a dolphin that's been bitten badly by a shark.

MICHAEL ZASLOFF: And then imagine that a month goes by. No doctor touches that animal. The animal goes back into the water, and comes out again. That wound is completely healed. And it's as if the dolphin had never been hurt before.

SANDEN TOTTEN: Zasloff says this actually happens with dolphins. He and his team are trying to understand how they do it. It seems part of it comes from a process called regeneration. This happens thanks to stem cells. These are special cells in a body that can morph to become any other type of cell needed.

MICHAEL ZASLOFF: The dolphin's wound says, OK, stem cells. I want you guys to start repairing this wound.

[MILITARY MUSIC]

CELL 1: All right, let's get this patched up, pronto.

MICHAEL ZASLOFF: One stem cell says I'm going to become a muscle cell.

CELL 2: I'll be muscle!

MICHAEL ZASLOFF: Another one says I'm going to become a skin cell.

CELL 3: I've got skin.

CELL 4: I'll do muscle too.

CELL 5: I'll be a fat cell.

MICHAEL ZASLOFF: Blood vessel-- one of these guys, says.

CELL 6: We're blood here.

CELL 7: I'm going to be blood.

MICHAEL ZASLOFF: And somehow, in ways we don't understand, something in that wound orchestrates the whole thing.

CELL 1: All right, skin-- you. You come with me. Muscle, over there. Fat, come with me.

MICHAEL ZASLOFF: And if I sound like it sounds magical, it is actually quite magical. And we don't understand virtually anything about the mechanisms of regeneration, but that's what happens.

[DRUMMING]

SANDEN TOTTEN: This process also lets salamanders grow back their tail when they lose it. We've got a whole episode on that. Check it out. Michael says dolphins also have powerful infection-fighting abilities, and they seem to heal with very little pain, meaning they might have built-in painkillers.

By studying how they do all this, Michael says we could possibly develop better ways to heal humans too. So when you cast your vote, don't just think about how cool echolocation is or what epic jumpers and swimmers dolphins are, but think about how their secrets could one day save countless lives.

MOLLY BLOOM: Well done, Sanden. Adeline, what was the coolest fact that you heard in there about dolphins?

ADELINE: Probably to heal. It's just cool that they can do that.

SANDEN TOTTEN: It's very cool.

MOLLY BLOOM: It is very cool.

SANDEN TOTTEN: Not many other animals can do that.

MOLLY BLOOM: Well, Marc, it is your turn now to hit us with some mind-blowing octopus facts.

MARC SANCHEZ: The octopus is probably one of the most misunderstood animals on the planet. People take one look at its eight sucker-covered arms, giant eyes, and beak for a mouth, and write the octopus off as creepy, or gross, or downright scary. And I get it. From a human perspective, a boneless three-hearted shapeshifter with a set of giant eyes that could easily land it in the staring contest Hall of Fame-- that's a lot to wrap your mind around.

But I come to you, the listeners of *Brains On,* because of your willingness to accept the unknown and be curious. In fact, the octopus is a lot like most of you listening right now-- an animal so curious about the world that it can't help but investigate, which the octopus has been doing in one form or another for over 500 million years, before even dinosaurs roamed the Earth.

ALICIA BITONDO: I guess a lot of people think of octopuses as being solitary which, in the natural world, they typically are. They don't really socialize with each other, but that doesn't mean that they're not interested in interacting with the world around them.

MARC SANCHEZ: Alicia Bitondo works with octopuses at the Monterey Bay Aquarium, and she's had plenty of time to befriend these eight-armed beauties.

ALICIA BITONDO: They're not typically social with each other, but when it comes to interacting with them as an octopus keeper, they are surprisingly interested in what we're doing. And in a lot of ways, they can seem really friendly. They have different personalities. Some of them are more shy. Some of them are more gregarious. But they definitely are interested in learning about us.

MARC SANCHEZ: Even though octopuses live alone most of their lives, they want to get to know the world around them. To do that, they use those suckers on their arms. Depending on the species, they can have up to 2000 of those suckers. Alicia says they feel like wet suction cups and work like a plunger.

ALICIA BITONDO: Yeah, so their suckers actually have chemoreceptors, which, basically, are like taste buds. They have cells in their suckers that allow them to taste for the reason that they use their arms to forage for food. And that allows them to identify food items without having to see them visually.

MARC SANCHEZ: At the same time they're observing and tasting with suckers, they're watching the ever-changing oceanscape. And to blend in with that, they use the most amazing form of camouflage. You see, an octopus is part of the cephalopod family. And, like we talked about in our cephalopod episode, octopuses can change the color of their skin to match their environment. Same goes for the texture of their skin. They can match the sandy ocean floor, or pointy coral, or seaweed, and they can do this all in a matter of milliseconds-- less than a second. And what makes their camouflage even more amazing is this.

ALICIA BITONDO: They have the ability to change color, but cephalopods are colorblind.

MARC SANCHEZ: I know. Colorblind. How is that even possible? Scientists still don't know how they match the colors around them so perfectly. But one thought is that their skin reacts like a mirror to its environment. So pass by something green and pointy, morph into green and pointy. Pass by something beige and flat, morph into something beige and flat.

[BOSSA NOVA MUSIC]

One of the big questions we get asked a lot here at*Brains On* has to do with an octopus's ink.

ALASIA: Hi, my name is Alasia. I'm from Rochester, New York. How do octopuses make their ink?

MARC SANCHEZ: Almost all species of octopus-- and cuttlefish in general-- can produce ink. It's made up of mostly melanin, which is a dark-colored pigment. And an octopus stores this ink in something called an ink sac. That one's pretty self-explanatory. The ink is extremely concentrated-- very dark. And before it gets squirted out, it's combined with this thick mucus stuff. This helps the ink blobs stay together in the water longer. So if you've ever seen one in the water, it looks like a smoke screen.

And if that's not enough, the ink also contains small amounts of chemicals that may interfere with a predator's ability to chemically sense the octopus, like smell or tasting. All this adds up to more chances to escape, which is usually what's happening when an octopus squirts its ink. Humans and other animals produce melanin too. It's what gives our skin colors. But enough about us and our bony bodies.

Octopuses are invertebrates, which means they have no bones. That also means they are big, fleshy meals for predators, so it's no wonder they spend most of their lives alone, trying to camouflage themselves. Virtually every animal with teeth sees them as food. But for an octopus, being an invertebrate is a superpower. They can bend in any direction they want. And being squishy means they can squeeze into cracks and holes that are way smaller than them.

ALICIA BITONDO: Their body is filled with water, so it's very contractile. The only thing that they're limited by, as far as how far they can compact, is the size of their brain and their beak, which is pretty small compared to the size of their actual body. So they're able to squeeze themselves through pretty tiny openings.

MARC SANCHEZ: Their ability to fit in the small places, and camouflage, and ink-- even their reputation for being loners-- these are all a means of survival. So kind and generous listeners of *Brains On,* this is why I think octopuses should be the clear winners of today's debate. They are survivors.

MOLLY BLOOM: Excellent work, Marc. Now Adeline, is there a fact that Marc just shared about octopuses that stood out to you as being particularly cool?

ADELINE: Ink.

MOLLY BLOOM: Very cool. What would you do if you could just spurt out ink whenever you wanted to?

ADELINE: Squirt my brother.

[LAUGHTER]

MARC SANCHEZ: That is a good plan.

SANDEN TOTTEN: Yeah, brothers beware.

MOLLY BLOOM: OK. So now, Adeline, I want you to think back to Sanden's arguments about how cool dolphins are, and then think about Marc's. And decide who won this round. Don't say it out loud-- just put a little tally mark on your sheet there. Did you decide?

ADELINE: Yes, I did.

MARC SANCHEZ: Ooh.

MOLLY BLOOM: Excellent.

[LAUGH]

Now listeners--

MARC SANCHEZ: The suspense!

MOLLY BLOOM: Listeners at home, don't forget to mark your point too.

[ADVENTUROUS MUSIC]

[WATER SPLASHES]

ADELINE: Having eight arms would really be useful if you worked in a restaurant. Think of how many plates you could hold.

MOLLY BLOOM: And dolphins would make great archeologists. They could echolocate ancient treasures hidden under sand.

ADELINE: What job would you give a dolphin or octopus?

MOLLY BLOOM: We really, really, really want to see your creativity in action. Draw us some pictures of dolphins or octopuses in the workplace.

ADELINE: Or write us a story. We'll share our favorites.

MOLLY BLOOM: Now, before we move on to the next round, I have a quiz for all three of you-- Marc, Sanden, and Adeline. It's time for the mystery sound.

[STRANGE NOISES]

ADELINE: (WHISPERING) Mystery sound.

MOLLY BLOOM: And remember, Mark and Sanden are playing for a point here. So are you guys ready for the mystery sound?

MARC SANCHEZ: Yeah.

MOLLY BLOOM: Yes. OK.

SANDEN TOTTEN: I cleaned out my ears last night.

[LAUGHTER]

MOLLY BLOOM: Excellent. Well, here it is.

[WATER BUBBLING]

[SQUELCHING]

[WATER SPLASHES] OK. So I know there's a lot of background noise and stuff, so I made a zoomed-in version for you so you can hear the relevant sound.

[SQUELCHING]

OK. That sound.

[SQUELCHING]

What could it be?

SANDEN TOTTEN: Could we hear the whole thing one more time because--

MARC SANCHEZ: Yeah.

SANDEN TOTTEN: --this is a real head scratcher.

[WATER BUBBLING]

[SQUELCHING]

[WATER SPLASHES]

MOLLY BLOOM: OK. Who has a guess first?

ADELINE: I do.

MOLLY BLOOM: OK, Adeline, what's your guess?

ADELINE: Water running or something?

MOLLY BLOOM: OK. What do you think's happening in the water?

ADELINE: Something like an animal, or something is splashing in it.

MOLLY BLOOM: Excellent guess. Marc, what's your guess?

MARC SANCHEZ: I heard the water too. It's definitely, I think, ocean-related. I'm going to go with a crab. I'm going to go with a crab being eaten.

MOLLY BLOOM: Good guess. Sanden, what's your guess?

SANDEN TOTTEN: I also thought something was being eaten. I thought maybe this was at a fish-- an aquarium, some sort of tank, and something was being fed. But I'm not sure what.

MOLLY BLOOM: OK. Those are all really good guesses, and we'll be back with the answer later in the show.

[UPBEAT MUSIC]

ADELINE: Guys, I can't believe it's almost your 100th episode.

MOLLY BLOOM: I know!

MARC SANCHEZ: I can't believe it either.

SANDEN TOTTEN: We've gotten so many amazing questions from kids.

MOLLY BLOOM: And the answers have been so fun to track down.

MARC SANCHEZ: I loved learning about the vomeronasal organ that helps dogs have such an amazing sense of smell.

[SNIFFING]

I wish I had one.

[SNIFF]

[LAUGHTER]

SANDEN TOTTEN: My favorite was learning about how the International Space Station was built because they basically used a giant robot from Canada that was shaped like an arm, which they called Canadarm-- best name ever.

MOLLY BLOOM: It is the best name ever. One of my favorite ever *Brains On* facts is that your nasal mucus humidifies the air you breathe. Thanks, snot. And of course, who doesn't love all the facts about farts?

ADELINE: We want to hear about your favorite fat that you've learned from *Brains On.*

MOLLY BLOOM: Send it to us at hello@brainson.org.

MARC SANCHEZ: We'll play some of them in our 100th episode. And if you have mystery sounds, or drawings of dolphins or octopuses, or questions you want us to answer on the show, you can send those to that same email address, hello@brainson.org.

ADELINE: That's what Nina did.

NINA: My name is Nina, and I live in Palo Alto, California. And my question is, why are flamingos pink?

MOLLY BLOOM: We'll answer that question during our Moment of "Um" at the end of the show.

MARC SANCHEZ: And if you stick around until the end, you'll hear the most recent group of listeners to be added to the Brains Honor Roll. That's how we thank all the awesome kids who send us their questions, ideas, mystery sounds, and super creative drawings.

ADELINE: Keep listening.

[UPBEAT MUSIC]

ADELINE: You're listening to *Brains On* from the American Public Media. I'm Adeline.

MOLLY BLOOM: And I'm Molly.

ADELINE: And today is our much-awaited dolphin versus octopus debate.

MOLLY BLOOM: We hope you are scoring along at home. We know you have some strong opinions.

[UPBEAT MUSIC]

AMAYA: I think dolphins are better because they are very friendly, and very smart too.

JASPER: I'm on Team Octopus because when they go to hunt crabs, they pounce and unflap skin between their tentacles, crouch down, and eat it up.

ASHER: I'm on Team Dolphin because they leap very high, and they are very smart. And they like to plays very much, and they are very beautiful.

ISABELLA: I think octopuses because they get to change color and their shape, and they have eight arms, and they have no bones, but they can move.

FRITZ: I think dolphins are going to win because they are much, much smarter than octopuses.

FREYA: The reason why I'm on Team Octopus is because octopuses can open boxes if they're trained, and also dig in the sand with their tentacles without any training.

[UPBEAT MUSIC]

MOLLY BLOOM: That was Amaya from Spain, Jasper and Asher from Watertown, Massachusetts, Isabella from Korea, Fritz from Fort Wayne, Indiana, and Freya from Australia. Now Marc and Sanden are going to take a little breather after that intense first round, so it's time to wheel in the tanks.

[WHEELS SQUEAKING]

Here to represent each side in the next round are an actual dolphin and an actual octopus.

[WATER SPLASHING]

DOLPHIN: I'm a dolphin.

OCTOPUS: And I'm an octopus.

MOLLY BLOOM: And we've asked them here to participate in a friendly comedy roast. Cue the music.

[COMEDIC MUSIC, APPLAUSE]

DOLPHIN: Thank you, thank you. I hate to say octopuses are ugly, but since they're always trying to look like something or someone else, it seems like they already know.

[BELL CLATTERING, LAUGHTER]

OCTOPUS: Great to be here. It's me, an octopus. Did you know that octopuses are good at solving puzzles? Well, one puzzle we've never been able to solve-- why anybody likes dolphins.

[DRUMROLL, LAUGHTER]

DOLPHIN: Puzzles, puzzles. Any time you bump into an octopus, they want to tell you all about how they can escape mazes. And dude, that's great, but you still haven't figured out how to escape being eaten.

[RIMSHOT, LAUGHTER]

OCTOPUS: Well, they say dolphins can do tricks, which is true. But the biggest trick dolphins ever pulled is convincing people that they're smart.

[CYMBAL CRASH, LAUGHTER]

DOLPHIN: All right. There are some robots designed to look like octopuses, which is great-- two nightmares in one place!

[COMEDY BOUNCE, LAUGHTER]

OCTOPUS: Whatever. Dolphins always look like they're smiling. You know who else is always smiling? The Joker.

[RIMSHOT, LAUGHTER]

DOLPHIN: I don't want to say that octopuses are cowards, but they certainly don't have a backbone.

[RIMSHOT, LAUGHTER]

OCTOPUS: Well, well, well. Dolphins use whistles to imitate one another, which makes sense because I don't think a dolphin has ever had an original thought in its life.

[RIMSHOT, LAUGHTER]

DOLPHIN: I've got an original thought. Octopuses think they're so smart since they have nine brains. That's a lot of brains for an animal that hasn't figured out how to live past five.

[DRUMROLL, LAUGHTER]

OCTOPUS: Sure, sure, sure. I can only live until five. But dolphins can live up to 40 years, which is a lot of time to waste taking pictures with humans on vacation.

[CYMBAL CRASH, LAUGHTER]

DOLPHIN: We can't help how beautiful we are. A friendly octopus is like an ugly dolphin-- nonexistent.

[RIMSHOT, LAUGHTER]

OCTOPUS: Dolphins have a blowhole, which makes a lot of sense once you realize that they're full of hot air.

[BELL CLATTERING, LAUGHTER]

[DRUMROLL]

MOLLY BLOOM: That was a dolphin and an octopus. Wheel out the tanks.

OCTOPUS: Thank you, thank you--

DOLPHIN: Thank you.

OCTOPUS: --so much for having me.

DOLPHIN: Feel free to catch me at all your vacations.

OCTOPUS: I am great--

DOLPHIN: Going whale watching? Look for my family.

MOLLY BLOOM: OK, Adeline and listeners, mark down a point for who you thought won that round-- the dolphin, or the octopus-- or maybe a tie.

SANDEN TOTTEN: You know why octopuses really can't be that funny?

ADELINE: Why?

SANDEN TOTTEN: They don't have a funny bone because they don't have any bones.

[DRUMROLL]

[GROAN, LAUGHTER]

MARC SANCHEZ: Sanden, if dolphins really won that round, it would be just a fluke.

[CYMBAL CRASH]

MOLLY BLOOM: Ooh.

SANDEN TOTTEN: Oh.

MOLLY BLOOM: So now, after their little breather, we're going to welcome Sanden and Marc back to this debate with the mystery sound. Here it is again.

[WATER BUBBLING]

[SQUELCHING]

[WATER SPLASHES]

OK. Any new guesses from any of you?

[GROAN]

SANDEN TOTTEN: It's so tough.

MARC SANCHEZ: Yeah.

SANDEN TOTTEN: This is a tough one.

ADELINE: Is it an underwater robot?

MOLLY BLOOM: Ooh, an underwater robot. Excellent guess.

MARC SANCHEZ: Gosh, there is some mechanical sound there too, like a humming.

SANDEN TOTTEN: Yeah.

MARC SANCHEZ: I'm still going to-- I'm going to stick with a crab getting eaten, I think.

MOLLY BLOOM: Crab being eaten? OK. Sanden?

SANDEN TOTTEN: Someone feeding something in a fish tank. That's all I can--

MOLLY BLOOM: OK. Here is the answer.

CAITLIN MARSTELLER: That was the sound of a giant Pacific octopus's suction cups coming off of someone's arm.

[SQUELCHING]

MARC SANCHEZ: Ah, tasting the arm.

MOLLY BLOOM: So it wasn't a tank. You were right about that, Sanden. That's Caitlin Marsteller. She's a graduate student at Alaska Pacific University, and she studies giant Pacific octopuses and what they eat.

CAITLIN MARSTELLER: We actually keep two giant Pacific octopuses here in the lab at Alaska Pacific University, and we tend to them, and take care of them. And so we feed them. And because they're so smart, we have to give them little tasks to get their food. So oftentimes, that will be in a little toy boat, or in a little ball that they have to reach their arms through holes to get the food out of. And so, because we feed them and they're in captivity, these octopuses are pretty excited when you get into the water.

MOLLY BLOOM: And they're so excited that they'll grab onto your arm with their suction cups.

CAITLIN MARSTELLER: They're actually incredibly strong. It can be scary depending on how big the octopus is because of how strong they are. It feels like-- it's just very bizarre. I'm not sure that I could compare it to anything. But it is very shocking. I oftentimes warn people about how strong they are.

MOLLY BLOOM: So Sanden, you're probably thinking, what? An octopus-related mystery sound?

SANDEN TOTTEN: Yeah, seems a little unfair, Molly. I don't know.

MOLLY BLOOM: Well, this sound is related to dolphins too.

KATE BURGESS: Yeah, so my name is Kate Burgess, and I'm a marine biologist. I'm based in Perth, Western Australia.

MOLLY BLOOM: And she studies bottlenose dolphins that live off of Western Australia.

KATE BURGESS: And as a part of that research, that's when I started seeing the octopus tossing.

MOLLY BLOOM: Yes, dolphins toss octopuses.

MARC SANCHEZ: No fair.

SANDEN TOTTEN: Hey, it's just a sport of the sea.

KATE BURGESS: So it basically brings up an octopus from the sea floor, and it throws it up into the air, several meters high and several meters forwards. And then it will swim under the water, grab the octopus again, toss it. And it could do this about 15 times.

MOLLY BLOOM: So why do dolphins toss octopuses up into the air repeatedly?

KATE BURGESS: We think that the purpose is because they're eating the octopus. So what we've found is that, a lot of the time we see them tossing the octopus, the head of the octopus is already removed, so they've bitten their head completely off. But the suckers on their eight arms are still active, even after the head is bitten off. So these little suckers in the arms have a reflex response. And so, the dolphin can't just swallow the octopus.

So with the octopus, they have to keep tossing the arms so that the suckers and that the arms go inactive. And that could take some time. And then, when their arms are limp enough-- tenderized enough from smashing it on the water, that is when they can swallow it without choking themselves to death.

MOLLY BLOOM: So this is a real-life dolphin versus octopus moment.

MARC SANCHEZ: This is why octopuses keep to themselves.

[LAUGHTER]

SANDEN TOTTEN: Yeah. I think in this competition, there was a clear winner, though. Someone walked away with their head.

MOLLY BLOOM: In this circumstance, dolphins generally come out on top, but the octopuses don't go down without a fight thanks to their very strong suction cups.

SANDEN TOTTEN: And before you judge, listeners out there, keep in mind that us humans also eat octopuses. And everybody's got to eat. Dolphins have just found a clever way to do it safely.

MOLLY BLOOM: Yeah, and Kate, the researcher we just talked to, said that dolphins go to great lengths. It's very hard for them to jump out of the water and toss the octopus so much, and she's even seen a severely-injured female dolphin do this. So it must be so worth it to them that the octopuses must be just incredibly nutritious.

SANDEN TOTTEN: Octopuses are good for something.

[LAUGHTER]

MARC SANCHEZ: Yeah. We're good for everything.

SANDEN TOTTEN: If dolphins eat octopuses, what do octopuses eat?

MARC SANCHEZ: Octopuses eat-- they eat a lot of crabs. And they do it with this cool tongue called a radula, which is this pointy tongue that they can drill right through the crab shell. And it's covered with these tiny, tiny teeth.

SANDEN TOTTEN: That is pretty cool.

MOLLY BLOOM: Adeline, do you think anyone guessed anything close to what the answer was?

ADELINE: Hm.

MOLLY BLOOM: Does anyone we get half a point for that? Sanden did say, in a tank. It was definitely in a tank.

ADELINE: I think he should get a point.

[GROAN]

MOLLY BLOOM: A whole point? Not a whole point. Half a point?

ADELINE: Yeah.

MOLLY BLOOM: OK.

MARC AND SANDEN: (SINGING) Ba, ba, ba, ba, ba, ba, ba, ba, ba-- *Brains On.*

MOLLY BLOOM: It's time for round 2. Marc, you're up.

MARC SANCHEZ: Let's start with octopus relatives. They're mollusks, which means they share traits with creatures like snails and clams. But octopuses, and cephalopods in general, have evolved like no other of their slimy cousins. When it comes to intelligence, our boneless buddies are head and shoulders--

[SAD TROMBONE]

They're head and shoulders above any other invertebrate. I mentioned before that octopuses have three hearts--two hearts to pump blood to its gills, and the other to send that blood to the rest of its body. And if you're going to have three hearts, you might as well have nine brains. That's right. An octopus has nine brains.

A human brain sits in a human head. You know that. You're a human. The brain is a collection of neurons, or nerve cells, that send information back and forth, telling the body what to do. An octopus has a main neuron-filled brain in its head too. But there's another brain for each of its eight arms. Let's listen again to aquariast Alicia Bitondo.

ALICIA BITONDO: Those brains allow them to complete tasks without having to check back with the main brain. And that's a big help when you have eight arms that might be doing eight different things. Rather than having to coordinate from the central brain, each arm can do its own thing.

[MYSTERIOUS MUSIC]

MARC SANCHEZ: The main brain might see a crab, and let the arms know to get the crab. But how it goes after that crab is completely up to the arms. They are independent. And there are lots of ways octopuses put those independent brains to use. For starters, they are good students. They can learn.

Researchers at Hebrew University set up a maze of clear tubing, like a habit trail for a hamster. And at the end of the maze sat a delicious snack. Oh, crabs. That's all an octopus needs to put on its thinking cap. With one of its brain-powered arms, the octopus learned how to navigate through the maze and earn a treat.

[MYSTERIOUS MUSIC]

Food, it turns out, is a big motivator.

BRET GRASSE: One example of octopus behavior is their ability to unscrew a jar in captivity.

MARC SANCHEZ: Bret Grasse is the manager of cephalopods at the Marine Biological Laboratory in Woods Hole, Massachusetts. He has firsthand knowledge of octopus smarts.

BRET GRASSE: If you look at most invertebrates out there, there's very few of them, if any, that can successfully understand that there's food inside of a jar, and then figure out how to manipulate the lid in such a way that it comes off, thus rewarding that animal with the prey within. So not only is that a difficult ability for an invertebrate, it's difficult for a complex mammalian vertebrate as well, like a dolphin.

[DOLPHIN SQUEALING]

MARC SANCHEZ: I couldn't agree with you more, dolphin. Octopuses are smart. And check this out-- not only can they learn behaviors like opening a jar, but the student can also become the teacher. There have been experiments where one octopus watches another one of its species figure out a new task, like opening a jar. The second octopus, the onlooker, can learn the same task at a much faster rate.

[UPBEAT MUSIC]

Let's take a look, now, at a particular species of octopus. This one has quite a fondness for real estate.

BRET GRASSE: The coconut octopus will actually carry around empty coconut shells or other bivalve shells, and use them for protection. It's almost like a mobile home.

MARC SANCHEZ: Picture a quarter-pound hamburger. Now add eight arms. And that's about the size of the coconut octopus. When it wants to move to a new location, it wraps most of those arms around the shell underneath its body, then it just starts walking on the ocean floor. No big deal. In addition to having a mobile hiding place from predators, shells also make a great place to lie in wait. What crab is ever going to suspect an octopus to emerge from a silly little coconut shell?

And now, let's turn to one of the masters of disguise, the mimic octopus. You already know about the cool color and shape-changing abilities that octopuses have. The mimic octopus can do all that, and it takes that idea to another level. The mimic octopus has evolved to imitate other sea creatures-- the black and white striped banded sea snake, for instance.

The mimic octopus can don its own stripes, stuff all but one of its arms in a hole, and sway menacing like the predator snake. It can also move all its arms together and swim flat like the banded sole fish that lurks in the sandy ocean floor. And it can even fan its arms to look like the tail of a poisonous lionfish.

But how did octopuses get so smart? One reason might be their rapid ability to evolve. Octopuses don't live all that long. Some species can live up to five years, but most live about six months to a year. As short as that might sound, think about how much they're learning in that time. There's brand new research that shows how octopuses and cephalopods can rapidly change their RNA. These are the molecules that inform DNA, which tells cells what they're going to be.

BRET GRASSE: They can edit their RNAs at a rate and efficiency that we've never seen before in any other animal. So, at this point, this research is so new that we don't know exactly what that means. But what is suggestive of is that they're highly able to adapt and evolve very quickly, whereas humans are horribly inefficient at editing their RNA, and it takes centuries and centuries. These octopus can rapidly do it over a lifespan.

MARC SANCHEZ: Having the ability to change RNA could be a huge advantage for octopuses. Like Bret said, the research is still brand new, but one possibility could be that they are highly adaptable to whatever changes the world throws their way.

[HIPHOP MUSIC]

MOLLY BLOOM: Wow. Octopuses are blowing my mind right now. How about you, Adeline? Is your mind blown?

ADELINE: Yes.

MOLLY BLOOM: OK, Sanden. Adeline and I are ready to be wowed.

SANDEN TOTTEN: All right. Octopuses are pretty cool, I'll give you that. And having nine brains-- that sounds neat, but sometimes quality is better than quantity. And dolphins have quality brains. Their body to brain ratio is highest in the animal kingdom, second only to humans. And there's a lot of clues that suggest maybe-- just maybe-- dolphins use their brains to speak a dolphin language.

[ADVENTUROUS MUSIC]

One tantalizing bit of evidence is that these mammals use something called signature whistles to identify each other.

[DOLPHINS WHISTLING]

It's something Denise Herzing from the Wild Dolphin Project has studied a lot.

DENISE HERZING: Signature whistles are interesting because they're the only-- what we would call-- referential signal that we know dolphins have. So a referential signal is basically a name for something. Dolphins have signature whistles-- names for each other. And that's the big prize for language because, if you're going to have a language, you somehow have to be able to refer to things not in the present time, like we're talking about things before and after, et cetera. That would mean that they-- at least by human definition-- that they would be able to talk to each other, and talk about what they did yesterday, and what they want to do tomorrow at the reef-- that sort of thing.

[DOLPHINS WHISTLING]

SANDEN TOTTEN: Denise and her team have even spent time with some wild dolphins interacting with an underwater keyboard to communicate with humans about what toys they want to play with. How cool is that? And speaking of communications, here's a communique from one of our listeners.

SOPHIA: Hi, my name is Sophia, and I'm from Allen, Texas. My question is, do dolphins around the world speak the same language?

SANDEN TOTTEN: We still don't know if dolphins have what we'd consider a language, but Denise Herzing says we do know groups of dolphins, called pods, sound different from other pods depending on where they're from, like a regional accent.

DENISE HERZING: I don't know. We don't call them southern drawls or anything like that, but--

[LAUGH]

--they all have whistles, and clicks, and squawks, but they have a little twist to them. So yeah, they have different-- what we would call-- dialects. Again, it's all about identifying your group. So if you're a bunch of dolphins in the middle of the ocean, you have to have some way of identifying, oh, this is my pod versus another pod.

[ADVENTUROUS MUSIC]

SANDEN TOTTEN: Speaking of pods, dolphins are very social-- another type of intelligence. Some pods have hundreds of members, and they're not just all family. Some are just friends. Heidi from Verona, Wisconsin wants to know more about that.

HEIDI: How do dolphins make friends?

DENISE HERZING: Usually, their mothers are friends. So mothers often hang out with each other. They become friends over the years. And if they have calves within the same amount of time-- so they give birth around the same time-- their calves are just naturally together because the mothers are foraging together, hanging out together. So they're just exposed in the community.

SANDEN TOTTEN: Denise says some dolphin friendships last a lifetime, like human friendships. But for some dolphins, being social isn't all fun and games. It's how they hunt, too.

DENISE HERZING: Dolphins just have so many-- just so many interesting ways to catch fish.

[DRAMATIC MUSIC]

SANDEN TOTTEN: Laura Engleby studies bottlenose dolphins. She's with the Dolphin Ecology Project, and was the first to observe and describe a style of hunting where dolphins swim around schools of mullet fish.

LAURA ENGLEBY: And they herd the fish, and they get them all together. One dolphin will actually break away from the group, and it will swim underwater really quickly, beating its flukes really fast, creating this vortexes that come up, this mud ring on the surface that you see appear. And that dolphin will then come around and join the group that was helping to herd--

[WATER BUBBLING, SPLASHING]

They all put their heads above water with their mouths wide open. And the mullet, who were trying to escape but couldn't because of that one dolphin that was making the mud ring, find the only way out is up in the air. So they all jump up in the air--

[WATER PLINKING]

--and the dolphins catch them like popcorn in mid-air.

[DOLPHINS SQUAWKING]

It's really incredible to see, incredible to watch.

SANDEN TOTTEN: Mm, flying fish snacks, anyone? Yum. Other groups of dolphins have learned to put sea sponges on their noses to protect them when they forage around sharp coral. How smart is that? Plus dolphins actually teach each other their skills, passing stuff down from generation to generation, like humans.

But maybe the biggest win for dolphin intelligence is that they pass something called the mirror test. That's when an animal can look in a mirror and recognize, hey, that's me. It's one of the many reasons dolphins are extraordinary. And we should keep studying them, protecting them, letting them swim free. And, of course, voting for them in this match-up.

MOLLY BLOOM: OK that is really cool. What's your favorite fact you learned just now?

ADELINE: How they are friends.

MOLLY BLOOM: Yeah, they're friendly, even if they're also fierce hunters. All right. I want you to give Team Dolphin or Team Octopus a point for whoever you think won that round. Marc and Sanden, it is your last opportunity to wow us.

MARC SANCHEZ: I'm so nervous.

MOLLY BLOOM: OK. These are our closing statements. And Marc, you are up first.

MARC SANCHEZ: Sanden and Team Dolphin have been worthy opponents throughout this debate. But let's be honest. They really never had a chance against Team Octopus. With more superpowers than you can count on eight arms, the octopus is clearly superior. Being able to squeeze its invertebrate body down to the size of a golf ball? Come on. Transforming its color and shape to blend in with its environment? Of course. Having the ability to rapidly edit its RNA, possibly making it one of the most adaptable animals ever? You bet.

[DESTINY'S CHILD, "SURVIVOR"]

I think I've said all that I need to say on behalf of Team Octopus. I'm going to let a song that stood the test of time have the final word.

I'm a survivor. I'm not gon' give up. I'm not gon' stop. I'm gon' work harder. I'm a survivor. I'm gonna make it. I'm a survivor-- keep on surviving.

[VOCALIZING]

MARC SANCHEZ: Oh, indeed. Team Octopus forever!

MOLLY BLOOM: Whoa. It was rocking out in the studio just now.

MARC SANCHEZ: As you should be.

MOLLY BLOOM: Those are stirring words, Marc. Sanden, take it home.

SANDEN TOTTEN: All right. Before you make up your mind, consider this. Dolphins have been known to not only hang out with people, but to save them. There are stories of people being attacked by sharks and thinking their fate is sealed, only to have a pod of dolphins come and scare the predator away, saving the day. I'd like to see octopuses try something like that. And there are even stories of dolphins leading ships through dangerous harbors to safe passage. If dolphins are willing to stick their neck out for you, why not return the favor and cast a vote for them? Thank you.

MOLLY BLOOM: That was beautiful, Sanden. OK. Now Adeline, I want you to give a final point to whomever was most persuasive in that final statement. OK. Count up the Dolphin points, and count up the Octopus points. Are you done counting?

[DRUMROLL]

ADELINE: Yep.

MOLLY BLOOM: OK, tell us who is the winner-- Dolphin or Octopus?

ADELINE: Octopus won by half of a point.

[CELEBRATORY MUSIC]

SANDEN TOTTEN: Phew. Wow. That was a really good match, though. I feel like--

MOLLY BLOOM: That was tight.

SANDEN TOTTEN: --these sea creatures are pretty remarkable.

MARC SANCHEZ: Yeah, I think they were both pretty great. So well done, Team Dolphin.

SANDEN TOTTEN: Look, if we had to lose, losing to Team Octopus is the best way to go. And we'll see what the popular vote is on our website--

[LAUGHTER]

--brainson.org. But well played, Marc. I will shake all two of your hands, and eight of your compatriot's hands.

MARC SANCHEZ: Yes. Many handshakes.

[UPBEAT MUSIC]

MOLLY BLOOM: Now listeners at home, we want you to tally up your scores too, and let us know if you agree with Adeline's verdict. You can head to brainson.org to vote in our poll. And if you're listening to our show in the Leela Kids app, you can vote right there. I think in every one of our debates, there's been a split decision between our co-host and the poll results, so there's still a chance that Dolphins can come out on top somewhere. So let us know who you think won the debate-- Team Dolphin or Team Octopus. Head to brainson.org to vote.

ADELINE: Now before we go, it's time for a Moment of "Um."

ASSORTED VOICES: Uh, uh, um, um, um, um, um, um.

FLORA LICHTMAN: Hey, *Brains On* fans. I'm Flora Lichtman. I'm the host of *Every Little Thing,* a podcast from Gimlet Media.

NINA: My name is Nina, an I live in Palo Alto, California. And my question is, why are flamingos pink?

[UPBEAT MUSIC]

FLORA LICHTMAN: This is an amazing question. Flamingos are my absolute favorite. The answer to this question is really surprising. They are pink because they eat things with pink pigment in them, like algae and crustaceans. And they can take that pigment from the foods that they're eating, and send it to their feathers. Can you imagine if we could do that? Have you seen *Willy Wonka?* This is like the Veruca Salt blueberry situation, but for real. And actually, a flamingo will get pinker if you feed it more of these foods that have this pink pigment in them. They are what they eat, at least color-wise.

But while we're on flamingos, I'm just going to throw in a few more facts because I do not want you to underestimate this bird. Flamingos are hardcore, people. They can drink boiling water. Yes. Let me repeat it. Flamingos can drink boiling water. This is helpful because they often live next to hot springs that spew out this really, really hot water, and they're fine with it.

Some flamingos live in these high-altitude wetlands in the Andes-- these really tall mountains-- and at night, it gets really, really cold. And flamingos will get frozen into their beds as they sleep. Their legs just get frozen in. Wake up in the morning, the ice starts to melt. They shake off the ice, and they're fine.

OK, here's one more. These wetlands where they live-- they can be so full of chemicals that, if you or I were to go in it, our skin would slough off. It would come off because of all the chemicals. For flamingos? No problem. I think the message is that pink can be tough.

ASSORTED VOICES: Um, um, um.

MOLLY BLOOM: Flora's show, *Every Little Thing,* is always chock full of amazing facts, and can be heard anywhere you get your podcasts. Check it out. Now, I'm going to read every little name on this list. It's time for the most recent group of kids to be added to the Brains Honor Roll. These are the kids who help us out by sharing their questions, mystery sounds, and ideas with us. Here's the most recent group.

[LISTING HONOR ROLL]

SANDEN TOTTEN: And *Brains On* is supported in part by a grant from the National Science Foundation.

ADELINE: If you're a fan of *Brains On,* we'd love if you would consider leaving a review in Apple Podcasts. It helps other kids and families find out about the show, and it makes us smile like the cutest dolphins in the world.

MARC SANCHEZ: You can also keep up with us on Instagram and Twitter. We are brains_on. And we're on Facebook, too. If you had eight arms, you could like us on all of those apps at once.

MOLLY BLOOM: And you can email your questions, ideas, mystery sounds, drawings, and high-fives any time to hello@brainson.org. And hey, we really, really want to see your drawings of dolphins and octopuses in the workplace.

ADELINE: Thanks for listening.

[UPBEAT MUSIC]