

Lutrinology with Dr. Chris J. Law

Ologies Podcast

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Oh heeey, it's a lone AirPods under the bench at a bus stop, Alie Ward, back with fresh horrors for you. Let's not get ahead of ourselves though. But straight up, if kids are listening with you, think about high tailing it right now to a *Smologies* episode instead. They're in the main podcast feed, they're up at AlieWard.com/Smologies which is linked in the show notes. *Smologies* are short and classroom safe. This one is not; it is not. Are we good? Okay. Let's get to otters.

First off, thank you listener Isaiah Nubens who suggested this guest in particular after hearing a review I read from A_wix from the Urology episode. And A_wix dreamed that lutrology was an episode and your dreams are coming true right now, all of our dreams.

Also, thank you just to everyone for leaving and writing reviews, they matter so much. I read every single one and this week we hit a really big lifelong goal of mine because of your reviews and subscribing. *Ologies* was the #1 Science Podcast on Apple. It's been five years, we hit #1, people! Let's do some air horns and some tiny, imperceptible butt dance. [DJ airhorn] Good job. Huge, giant goal, I can't believe it. Thank you so much.

Thanks also to everyone on Patreon.com/Ologies for supporting the show. Each week for reviews, I choose a fresh one to prove that I see them all. And this week, thank you to ShermWerm45732, who wrote:

Come for the science facts, stay for the feels.

And also thank you future ologist Mykenzie King who described the show as, "A massage to my brain while drinking espresso."

Okay, get into it. Lutrology. It's a word, it's been cited in the literature... one time, but that counts. J.C. von Vaupel Klein, a prominent scholar of crustaceans coined it while describing a study about sea otters that was so well written, it was an interesting read, "Even for the non-lutrinologist." So, *lutre*, sidenote, comes from a mix of old, old words for water, hence otter... water... wauter. And then the 'L' they think was maybe picked up from *lupus*, like a water wolf, or *ludo* meaning, to play. It's anyone's guess. But otters are in the same Mustelid family as weasels, and wolverines, and minx, and also badgers. And they are full of must, and musk, and mischief and you're about to get absolutely destroyed by otter facts. Your small talk will never recover. Otters will be all you think about for the remainder of your life.

Also, with that, I have to issue a trigger and a content warning, without spoiling too much, otters are *not* violent and many of their behaviors would result in criminal charges if water weasels had a justice system. But in other ways, they're better at relationships than we are.

Now, this otter expert studied environmental systems for undergrad and got his PhD in Ecology and Evolutionary Biology at UC Santa Cruz and is now doing a Postdoc at the University of Washington in connection with the American Museum of Natural History and the University of Texas. So, buckle up, bow howdy, hot damn. Get ready for coastal versus inland otters, skull morphology that tricks our brains, teeth, fur, beach pastries, rock pockets, the perils of selfless motherhood, kelp naps, the nostalgia of otter droppings, molar crunching, and of course, otter handholding with scientist and certified otter expert, Lutrinologist, Dr. Chris Law.

Chris: My name is Chris Law and I go by he/him.

Alie: Cool, and Doctor, correct?

Chris: Yes. Dr. Chris Law.

Alie: Dr. Law. We had a suggestion for this ology a few weeks ago. Someone had a dream also that there was an otters episode, and they woke up and looked for it and then they realized that they'd just dreamt it up, and that is why we hustled to find you, because someone had a need for an otter episode. So, can you tell me how you came to be a weasel wizard?

Chris: Yeah, so I essentially started my science career with *Polychaete* worms during my undergrad at UC San Diego.

Aside: These are bristly, segmented marine worms, which are almost as cute as otters, if you're into worms.

Chris: And then as I was applying to grad school, I met with my future PhD advisor Rita Mehta at UC Santa Cruz, and we were just chatting about potential research projects. She studies moray eels, so I was just assuming I was going to be working on some fish project which is fine, because that was my plan, to just go up the food chain. [*Alie laughs*] But then we were just chatting a little bit and she just brought up the idea, "Why don't you just work on sea otters? Because we're in Santa Cruz and they're just all over the place." And obviously, I was just like, "Yeah, of course!"

Aside: So, Chris has lived up and down the sunny Pacific coast in San Diego, and Santa Cruz, and Orange County, and like nearly every Californian, he was familiar with sea otters. So, the suggestion to work on them was like, hell yes, jackpot, jackpot...ter.

Chris: I've seen them before and like, they're adorable little teddy bears that you just want to hug and who doesn't want to work on them? So, the moment she said that I just jumped on that bandwagon and started doing some research into what potential projects I could do. And since they eat all these hard shell prey items, one of the questions people really wanted to look at was how are they actually breaking into those hard items? So, I kind of just got started on that.

So basically, in undergrad, I come from a phylogenetics background and evolutionary background, so kind of halfway through starting to look into sea otters, I just got this idea: I have to build a phylogenetic tree of all of the... not only otters but the weasels, martens, wolverine, all those guys. So, I just started building that phylogenetic tree and learning a bunch of natural history by reading about this group. I, at first, didn't even know that weasels were related to otters so I learned more about weasels and went down this rabbit hole to want to study why they're so elongate.

Alie: Yeah, they are like the Dachshunds of the sea. Why are they so long and squiggly?

Chris: The idea is that it came around 15 or so million years ago, that's during the mid-Miocene climate transition, when temperatures drastically decreased and this expansion of grasslands occurred, which then led to diversification of rodents. So, then this body elongation is hypothesized to have allowed those weasel-like creatures to go underground to chase all those rodents in these tight crevices and whatnot.

Alie: Wow! I had no idea that that is why bodies were long. I mean, is that what Dachshunds are doing? Aren't they kind of like rodent, hole-dwellers?

Chris: Yeah, so that's the idea behind their kind of artificial selection, where people are trying to breed these elongate looking dogs, so they can go in these tight crevices or burrows to try to get those rodents during hunting.

Alie: Are they just chock-full of vertebrae? Do they have more vertebrae, or do they just have longer vertebrae than other animals?

Chris: That is a fascinating question. So, if you think of snakes or eels, they become more elongate by simply adding more vertebrae, which makes sense. But then with mammals, we're actually constrained to the number of vertebrae that we have. In carnivorans, which are like dogs, bears, cats... they have about 20 thoracic-lumbar vertebrae and that number rarely, rarely changes. So, it can't become elongate by just adding additional vertebrae, they have to actually evolve relatively longer vertebrae.

Alie: I was always wondering that about, like, my short-ish poodle dog versus a Dachshund. Or a weasel, those long, almost wormy bodies just have longer backbones, each individually?

Chris: Yeah exactly, so they have the exact same number of vertebrae, it's just some of the breeds might have relatively longer ones. Although, I don't think that anybody has really looked into that so it would be really interesting to see the skeletal elements of what actually contributes to those different body plans in these different breeds.

Aside: So yes, every time you see a dog that you would like to pet, know that it has 30 main vertebrae, and then between 5 to 23 bonus tailbones. And corgis, side note, they're born with tails, did you know that? Big, bushy fox tails. Google it. Same with Australian shepherds and other herding dogs. But they tend to get the chop by breeders because when they're actually used for herding, nobody wants a stomped-on tail.

And I read one 2018 study titled, "C7 vertebra homeotic transformation in domestic dogs – are Pug dogs breaking mammalian evolutionary constraints?" Which found that 25% of pugs had one fewer vertebrae than all other breeds. And I like to think that there's some berobed man in the sky, and God took a vertebra from a snorting, farting pug dog and made humans with it.

Now, how many do you have? Well, you were probably born with 33 but you now have around 24. What happened? ["Dad, I think you ate the bones."] Nope, they just kind of fuse together at the bottom like a bag of Raisinetes you left in the car, only it's your sacral spine and your coccyx. For more on this, see the Osteology episode.

But enough about us, let's talk about gazing in wonder at otters. Now, Chris also happens to make really gorgeous science art, charting the evolution of these mammals in this beautiful colorful detail.

Alie: And where in the tree of life are they? Because I feel like I think of an otter and it seems like an aquatic cat, but also kind of like an upside-down dog. What's happening?

Chris: Yeah, so it's in the order *Carnivora*, and *Carnivora* is split into two different main groups, the *Feliforms*, which are like your cats, and then the other group at the *Caniforms* which are your dogs, bears, pinnipeds, and the mustelids which are the raccoons, weasels, skunks, otters, all those guys. So basically, in *Caniforms* it goes: dogs, bears, pinnipeds, then skunks, the red panda, raccoons, and then the mustelids, which includes that really species-rich group of otters, weasels, wolverine, the martens, the honey badger, the European badger, there's over 60 species in *Mustelidae*.

Alie: Do you dream about this stuff? Because I know you make art about phylogenetic trees. Is your brain always trying to construct visuals of this?

Chris: Yeah, I mean that's why I love learning how to make phylogenetic trees because I think it's such a cool way to showcase the evolutionary history of, basically, the tree of life. And with the carnivorans in general, it's such a diverse group and so many different types of body plans and different sizes and shapes, so it's really cool to be able to visualize all of that. And how one species came from this group of species, or how these two closely-related species are from the same part of the tree but look so very different. So yeah, that's part of the fun parts of being an evolutionary biologist.

Alie: Are you an organized person in general?

Chris: I pretend to be. *[both laugh]* It comes and goes.

Alie: Now, question: what is it like to be an otterologist? Do you get to touch them? Do you get to hold them? Do you get to pet their fur? Do you get to touch a pelt? Do you get to hold their hand? Do they give you clams? What is your life like?

Chris: Oh, I wish I could do all of that. The closest I've done is touched one. It is honestly, the softest thing, at least a sea otter, it's the softest thing I've ever felt. I totally understand why people back in the day really wanted to hunt them because that pelt... you just want to rub your face on them because it's just so soft and I'm sure it's also pretty warm. In terms of doing all the other stuff, in terms of wanting to hold their hands, I don't think I'd ever want to do that with a wild otter because they will try to eat your face or bite your face if they could. *[chuckles]* They're pure evil.

Aside: They are pure evil, says Dr. Chris Law, a professional lutrinologist. You knew this was coming, didn't you?

Alie: Okay, I'm glad we jumped right into that because I feel like somehow, I became informed a few years ago that otters, the cutest things ever, are also absolute bastards. Evil, sexual predators, they will steal your stuff and sell it at a pawn shop, they're the worst. Give us a dark side. How fucked up are otters?

Chris: *[laughs]* Oh... I mean yeah, basically everything you said is true. Probably the worst thing is that they can also be dog killers. Apparently, there are a couple incidents where somebody's dog was just barking at one of these otters along the dock or something and I guess that otter just got fed up, went up to it, and just apparently dragged it down...

Alie: Whaaaaat?

Chris: ... and I believe it might have drowned it, but again, this is just through word of mouth so, who knows.

Aside: Okay, it's September 2021, hurricane Ida is ruining lives, the pandemic rages on via the Delta variant, and *Squid Game* premieres. Yes folks, that was less than a year ago. *[music from Squid Game plays]* But meanwhile, in Alaska, otters are terrorizing Anchorage citizens, literally chasing and sinking teeth into a 9-year-old boy, and this is not the first time. According to one news source, "Officials are currently investigating whether the incidents all involve the same group of otters." And it's not just in the last frontier, it's also in the sunshine state.

[clips from various news reports]

"Cell phone video of a charging otter."

"This is a picture of the alleged otter, sent to us by Greg Butler. Butler says the otter attacked his dog, Chester."

"Chester was bitten on the nose after an otter charged through his screened-in porch. Two of his human neighbors were bitten on their heels and hands."

"This otter just comes out of the lake and starts to chase my bike. Actually just went right after my bike!"

So, while rare, these incidents are not isolated. And in communities all over the globe, fearful locals demand of officials, "You otter get that otter otter here."

Chris: I've heard this a couple times, and this has happened a couple times so it's kind of gnarly. [laughs]

Alie: I mean, how big are they? Because I feel like river otters are bigger, right? How big is a sea otter? And also, what's the difference between a river otter and a sea otter?

Chris: Oh, so actually a sea otter is much bigger than a North American river otter but in California, they don't get that big, those are more Alaskan otters, but they are still much bigger than a little river otter.

Aside: And just to back up a little bit... There are 13 species of otter, globally. The US has two species; the little river otter, about the same weight as a pug, and then the sea otters, which off California can be up to 90 pounds, like a Rottweiler. Although the beefier, Alaskan variety can top 100lbs. Think like a Bernese Mountain dog, floating around, gnawing on a crab. Now, there are also Eurasian otters, about 20 pounds, Dachshund-size; some medium-sized African otters; South American giant river otters, which are somewhere between an American river otter and a sea otter in size; and then there's the teeny Chihuahua sized Asian otters. But yes, in the US, I was surprised that the river otters were smaller and that the sea otters were these hefty, clam-eating sea beasts. They're big and they're not cuddly.

Chris: Definitely can be pretty vicious if you get too close to them.

Alie: How did some evolve to hang out in freshwater and others seawater? Or does it even matter because they're breathing air... right? [*"I'm amazed we don't all have fins and gills."*]

Chris: Yeah, so actually all other otters are primarily freshwater so it's the sea otter that's unique. It's that oddball that evolved from all the other otters about 8 to 10 million years ago and it went on its own evolutionary trajectory. So, everything it does, everything about their physiology is very different compared to other river otters. And sea otters are apparently just found in the ocean whereas river otters, especially like North American river otters and Eurasian otters, will actually go into the marine environment as well. So, you can be in locations like in Washington where there will be both river otters and sea otters.

Alie: Oh! Where are they sleeping? Do they go home at night?

Chris: Sea otters?

Alie: Either one. Do they sleep in the water? Or do they have a cave that they hang out in onshore?

Chris: Yeah, so river otters have dens that they hang out. I've never actually seen one, but yeah, presumably along the shore. But sea otters actually just float in the water, and I'm sure you've heard stories of where they'll wrap themselves in some kelp so they don't float away, and they can take a nap that way. They're relatively small marine mammals, they burn a lot

of heat, so they have to sleep a lot to refuel, and you always see them just taking a snooze to conserve some energy. [*People cooing. "They're holding hands."*]

Alie: Do you think they hold hands in the wild? Or is that just a publicity video from a zoo?

Chris: [*laughs*] So, I actually don't know. I remember giving a presentation at this, I think, sea otter conference and I had that image of two sea otters holding hands that was taken at one of the aquariums and somebody gave me shit for it [*both laugh*] because she said that they don't hold hands in the wild. But then, apparently, a couple weeks or months later, there's some photos of wild otters holding hands. So, I don't know. [*laughs*]

Alie: They have a good PR team. They're like, "Listen, TMZ is around the corner, we're going to have to do something."

Aside: Also, shout out to otter paparazzi, Drew Wharton, the founder of SeaOtters.com, who in 2016 captured the first photo of otters doing this in the wild. Like 100% a celebrity couple holding hands, walking into Nobu to eat a bunch of raw seafood. Also, SeaOtters.com has live sea otter cams, if you would like to stare at them with like-minded people over the internet.

Alie: What is the otterology community like? Are people really focused on conservation? Are they trying to figure out how to increase populations? Is there a big conservation effort around these guys?

Chris: Oh yeah, there's a huge effort out of all the major aquariums; the Monterey Bay Aquarium in California, the Seattle Aquarium in Washington, I'm sure up in BC and Alaska also has great efforts. The one I'm most familiar with are the ones down in central coast California, the Monterey Bay Aquarium, UC Santa Cruz, the US Geological Survey, Fish and Wildlife. Basically, all these organizations, they do all this great outreach work and also a lot of work with the wild populations to make sure that the population is doing well, that individuals are healthy, and that all the possible things that could affect them are looked into.

Alie: How is their population... like the sea otters for example, I feel like people are really rallying for the sea otters. How is their population? Is it rebounding at all? Because we just did an episode on urchins and they were like, "Urchins are everywhere because sea otters are not."

Chris: Yeah. So, I guess it's very different depending on what population of sea otters you're talking about. So, that kelp, to urchin, to sea otter system is really describing the Alaskan population pretty well. So, that classic, killer whales eating the sea otters, which then increases urchins, which then decreases kelp forests. But then in California, the system is a little bit different, where the sea otter population is actually relatively stable. I think there's about 3,000 individuals in coastal California, I could be wrong on that, I'd have to check my numbers.

Aside: He's right.

Chris: But basically, the idea is that they are kind of constrained between Point Conception down south, and Half Moon Bay up north. And the reason why they can't expand is because they're being attacked by sharks up north and I guess fishermen are pushing them back up from the south. So, they can't really expand and that's why they're more at like this carrying capacity where they're running out of food and the otter population can't really increase because of that.

Aside: So, in California, they're stuck between a net and a shark place. And sea otters have been protected since the 1911 International Fur Seal Treaty after colonization of North

America led to a dangerous decline. And I looked into it, and yup, there's about 3,000 sea otters off the coast of the Pacific in California. And then 90% of the world's sea otters are off the coast of Alaska, there's about 25,000 of them there.

Now, what about the river otters? It's estimated about 100,000 of North American river otters exist in the US and Canada, according to the banger of a paper, "River Otter Status, Management and Distribution in the United States: Evidence of Large-Scale Population Increase and Range Expansion." So, that's good. And of the world's 13 species, 8 are threatened, including the Asian small-clawed otter, and the smooth-coated otter and one called the hairy-nosed otter, which sounds cute, but it might be ferocious. All these otters are like, "We gotta make more otters."

Also, I'm going to warn you right now that this next part contains scenarios and language that might be literally triggering to victims of violence. Fuckin' otters dude... otters fuckin' dude.

Alie: Sex lives of otters, what's going on? How are they making more otters? Is it a horror show?

Chris: [laughs] It basically is very, it's basically just [bleep] unfortunately.

Alie: Yeah, that's what I heard, that's what I heard, that's what I heard.

Chris: Yeah.

Aside: It's not great people. And I'm bleeping out a word that starts with 'R' that means sexual assault. I know it can be hard for survivors to hear so I'm just erring on the side of bleeping. Augh, otters.

Chris: So, females have it rough because basically the moment they become sexually mature, they are either pregnant, or have a baby or a pup with them, until they literally exhaust themselves to death. It's called End Lactation Syndrome for the females, where they basically just die because they're just so exhausted from putting so much energy toward their pups or toward milk production and they also have to forage for their pups.

And I'll say one thing: some of those pups are basically just like little parasites. I remember just watching a mom and a pup interact, and this pup is almost bigger than the mom, and it was still hanging out with mom. And the moment mom goes diving, the pup just hangs out on the surface being all cute and happy but then when the mom comes up with food, it just immediately swims to the mom and starts crying and begging for food. And again, this pup is almost bigger than a mom. [laughs] Basically, pups usually stay with a mom for 6 months up to a year, so usually those slackers that are staying up for a year are usually just as big as the mom, still continuously getting food from it.

Alie: How did evolution allow for that? [Chris laughs] How can they sustain that? These poor ladies. And what are all the bachelors doing? Are they roving in packs of otters? Are there packs of bachelor river otters, just terrorizing?

Chris: So yeah, the evolution question... I think it's just because that pup will be nice and fat and ready to go hunt on its own. If it gets weaned too early, or it leaves mom too early, it's not going to be able to eat or get enough food and it's just going to die and, in that case, you're just going to lose your offspring and genetic potential, if that happens. So evolutionarily, there might be that reason for why that pup really wants to extract all the nutrients from the mom before it can go off on its own and do its thing. ["Oh no, no, no, no. I live with my mom." "Oh" "Yeah, you hungry? HEY MA! CAN WE GET SOME MEATLOAF?"]

And in terms of the males, oh yeah, those guys don't do anything. Basically, the males are constantly circling females because once that pup leaves, it's going to go reproduce to pass off its genes. And then once that happens, it's a terrifying show that, I mean, I'm happy to describe it but...

Alie: Give us the dirt.

Aside: One thousand content and trigger warnings.

Chris: So normally, once that female is free, the male would get on it and it's essentially [*bleep*] where the male will bite onto the female's nose. [*Alie gasps*] So, often you'll see females with ripped noses [*Alie yelps*] and you can easily tell that's a female because it's biting down on that nose and basically forcing itself on it to, you know, pass its genes.

Alie: Oh my god.

Chris: So, once that happens, the male just leaves and will probably never see the female ever again.

Alie: [*groans*] I like, want to file for restraining orders on behalf of female otters. This is not okay!

Chris: Yeah.

Alie: It's not okay! Do they have any defenses? Like, do they have thicker fur? Or do they have an extra claw anywhere or, like, mace?

Chris: I don't think so. And also, the females are much smaller than the males so they're kind of defenseless in that regard.

Alie: Oh my god, I want them to evolve a pepper spray gland. That's horrible. Horrible. I want them to go on strike and live on their own happy island and be like, "Get your own urchins!"

Chris: I know, I know. If only they could! Like I said, basically that's the female life and they do this for maybe 12 to 15 years at most in the wild, where basically they just get pregnant a couple times, or a lot of times during their lifetime, and just reproduce and have pups. And the cycle just continues over and over again until they die from exhaustion. It's pretty nuts.

Alie: [*moans*] What about in captivity? We have no right obviously to enforce any of our assumed sexual ethics on otters. But in captivity are they like, "Hey!" [*"Dude, knock it off."*] or do they just have to let nature be terrible?

Chris: No. Usually in captivity, all the otters that you might see in aquariums are all females because a lot of these bigger aquariums, they actually use them as surrogates for wild otters that might be orphaned. So, if the mom in the wild dies, there's usually this pup that's wandering alone and since they're threatened, at least in California, there's been a program to basically take these otters in, and especially if they're female, have the surrogates raise them until they can re-release them in the wild when they're old enough.

Alie: Do they do that in the wild? Do they, like penguins, do they adopt orphaned otters in the wild? Or is that kind of unique to captivity?

Chris: That's usually unique to captivity. I don't think I've ever heard any situation where a wild female would take in another stray pup. And usually, if the stray pup is alone, it's not going to even survive for that long because it's basically defenseless and helpless; it can't even go catch its own food by itself, so it'll just die. So yeah, that's why like the Monterey Bay Aquarium really relies on surrounding networks, or volunteers, or people just observing or

seeing a wild otter by itself, or a little pup, someone will call it in, and they'll send out a team to bring it in if they can't locate their mom or something like that.

Alie: And I mean, they're so cute. Now I'm a little mad at the pups too, but why are they so cute? From a morphological, as someone who has studied their bone structure and how long-noodle they are... how and why are they so cute?

Chris: That's a great question. I don't know why they are so cute; but how, it's because their skulls are very flat faces. So, if you look at basically a newborn sea otter skull, it doesn't have that pronounced snout yet, so it's a very puppy dog face, or even a newborn baby's face, which I guess in our brain is hardwired to want to take it, and hold it, and protect it, and all that.

Aside: This, side note, is called baby schema and it's when a juvenile organism has a large head and a round face and big eyes, and smaller other features like ears, and snout, and mouth. And fun fact, Mickey Mouse has aged in reverse, his features have become more baby-like with each decade. And when adults retain some cute characteristics, our brains get confused and say, "Protect them at all costs," even if they are ghouls, like your tiny racist grandma, or a sea otter.

Chris: But in terms of why they might be like that in the wild, I have no idea what kind of selective advantage that is. Maybe other animals think it's cute *[laughs]* or other otter individuals might have some kind of selective pressure on it, but I have no idea.

Alie: I'm going to go back to school, I'm going to get a PhD in otters. They're so cute because their babies are such assholes that you would literally not feed them if they weren't so cute! *[Chris laughs]* Augh, can I ask you some questions from listeners who know that you're coming on the show?

Chris: Yeah!

Alie: Okay, we're just going to lightning round, we're going to see how many we can get through, is that cool?

Chris: Yeah, sounds great.

Aside: But before we crack into your questions, we're going to toss some coins into an ocean of need. Chris chose Sea Otter Savvy which increases awareness of protecting sea otters and encourages responsible viewing guidelines. For more about what they do and to check out volunteer opportunities, see SeaOtterSavvy.org and savvy has two Vs and not two As and I always mess that up. But yes, a donation went to SeaOtterSavvy.org, thanks to sponsors.

[Ad break]

Okay, your questions, the first being from an actual patron of the show.

Alie: Okay, first question from very important listener named Larry Ward, also known as Grandpod around here, it's my dad. He wanted to know *[Larry: "Do they eat kelp or do they just live in kelp?"]* **Alie:** *"That's a good question. I don't know!"* Do they eat kelp, or do they just live in the kelp?

Chris: Yeah, so otters don't eat the kelp, they just live in it, so they'll use it and wrap themselves in it to stay in one place if they're sleeping. But they really rely on it indirectly just because it's such an important ecosystem in California where basically all their invertebrate prey that they're eating live; off it, or live under it, or live on it. So, it is really essential to them indirectly.

Alie: Ah! So, it's like their apartment and the grocery store, all at once.

Chris: Exactly. They rarely leave it just because it's a nice, protected area, so it's harder for predators to find them.

Alie: Nice. Are they meat eaters only? They are carnivores, right? They typically just exist on just... sushi buffet?

Chris: Yeah, so they essentially eat your favorite types of seafood. So, you got your snails, your mussels, your clams, your abalone, your crabs, and urchins. They also eat these, kind of, gross-looking things called fat innkeeper worms, I don't know if you've ever seen pictures of them.

Alie: Yes, I have, they look like dicks, they look like disembodied, horrible, floppy dildos.

Aside: Listen, okay listen. These worms are also called penis fish, and I'm a fan of a phallus, trust me on that, but you have to imagine them just poking up like Whack-A-Moles in the mud... just like slurp, slurp, slurp, boing. And when it's time to go potty, fat innkeeper worms squirt a steady, liquid stream out of one end. And sometimes beaches are littered with these flaccid worms, they're beached by the thousands, like the most surreal dump truck accident you've ever seen. But they're also a delicacy and they're considered an aphrodisiac, and like most things, it's really just set and setting.

Alie: They're not as picturesque as maybe you'd want them to be. But yeah, so fat innkeeper worm, is what they're called?

Chris: Yeah, so they'll eat those as well. But most of their prey are usually hard shell prey because they are more calories.

Alie: aha! Okay. That brings us to a question that everybody asked, Jamie MacNeal, J. Cooz, first-time question-asker Francesca Huggins, Lene Olszeth, Jesse Hurlburt, Alicia Henning, Emma Sherwood, Mariah McGregor... Everyone wanted to know in J. Cooz's words: Is there commonality between otter's favorite rocks? Like, do most otters use one particular kind of rock? Do they have a favorite rock? Jamie MacNeal wants to know: How do they pick? A lot of people need to know what's up with the rocks.

Chris: *[laughs]* So, that is a myth. *[Alie gasps]* They do not have a favorite rock.

Alie: WHAAAAAT?!?!

Aside: Flimflam, busted.

Alie: What? Wow. Okay.

Chris: So often, these rocks are pretty big, and they do have a little, I guess you could call it a pocket, but it's just a flap of skin that they can keep prey in. But these rocks are usually too big to do that. So normally, what they do is they come up with a rock and their prey, they put the rock on their belly, use it as an anvil and break things, eat the things, and they keep doing that. Basically, when they're done with the rock, they just do a little turn, the rock falls down, and then they go on with their lives. *[laughs]*

Alie: Wow.

Chris: So, they don't really have that favorite rock. They might reuse the rock if it's the only rock that's available because they're right there and decided to go back down and get more food and that rock happens to be there. So, they might pick it up again to use it, but they're definitely not traveling around with it.

Alie: That's hilarious. I completely thought they had a fanny pack and were like, "Where's my good rock? Not this rock." What about, from a philosophical perspective, is that tool use? Or is it only a tool if you use the rock to smash the clams and not the clams to smash on the rock? You know what I mean?

Chris: Yeah. We still call it tool use, because you're still putting an object onto your stomach and then actually using it as a tool, essentially, to break something open. I'll say that otters can also use other objects as tools. So, sometimes they'll use a shell to break open another shell, they'll use bottles, they'll even use docks and people's boats which people might not like to break things open. So, they'll use anything.

Aside: Now, from using tools to being tools... [*hushed tone*] I'm sorry.

Alie: Daniel Schmaniel wants to know about their... as long as we're going to go back to them being terrible: Are the observations of sea otters assaulting, sexually, and killing baby seals, are those common or is that exaggerated?

Chris: I don't know how common it is, but it definitely is to a point where there's multiple observations of them doing that. So, the way males' territories work is that the dominant males have territories that exclude other males from their territories. And in that kind of competition, there's always going to be losers and they're excluded from these territories. So, if they can't have their own territory to mate with females they get, I guess, frustrated, and find a little baby seal to do its... to basically [*bleep*] it, I guess. And that usually doesn't end well with the seal.

Aside: Sometimes it doesn't end well, even for the otters. According to a hellscape of a study titled, "Patterns of mortality in southern sea otters," about 11% of dearly departed sea otters spotted by researchers died by mating trauma... 11%. And the violence is not just male to female. Within the same species, boy battles, sea otters can also hit below the proverbial, anthropomorphized belt line.

Chris: One thing that's crazy with these male-to-male conflicts is that when they fight each other, they essentially go after each other's baculums, [*Alie gasps*] which in carnivorans, they have a bone called a baculum in their penis. So, they go after each other's baculum to try and break it. So, it's pretty brutal out there.

Alie: [*drawn out, croak-y voice*] Oh wooow. How did they learn to be such assholes? Are most North American mammals... Are most animals this ferocious? And we're just surprised because they're pretty adorable?

Chris: Honestly, I have no idea how that compares to other mammal groups. One of the nice things about sea otters is that they have to come to the surface and they just float, so it's just so easy to get these observations because they're also really close to shore. So, we're able to get this detailed information, whereas other smaller animals, like even river otters, it's really hard to spot them and actually see what they're doing in the wild, so who knows what they're doing out there. [*"Weird, wacky stuff."*]

Alie: You know what's funny is I just looked at Emma Sherwood asked: I learned on a high school field trip to the zoo that male otters break each other's dicks to reduce competition, is this true?

Chris: There you go.

Alie: Emma Sherwood knows what's up. Kathleen Sachs wants to know: Can a troop of dedicated river otters really kill an alligator or a crocodile? Is that flimflam?

Chris: So, there's these things called giant river otters in South America in the Amazon, and these things are a little bit longer than the sea otters. If you ever see pictures of these ones, they are so weird looking; they are another older lineage of otters that kind of offshoot from other otters like 10 million years or so. But they've got buggy eyes and their face just looks like an alien otter. But these guys are huge and they actually are in family units, and they will actually, sometimes go after like caimans. There are even reports of them, like, fighting off jaguars.

Alie: Nooooo.

Chris: Which is pretty crazy.

Aside: For more on this, join the 4.2 million other humans who have watched a YouTube video titled, "Giant otter bite jaguar head, seriously injured for daring to attack its comrades," uploaded by user Wildlife Today. This and the other 14 videos I subsequently watched taught me that a brawl with giant river otters sounds a lot like the worst game of Marco Polo. [*continuous otter vocalizations, cross between seals and yappy dogs*] Why? Well according to the paper, "Airborne vocal communication in adult neotropical otters," these creatures have a menu of sounds they make to chitchat. From a "ha!" that's like their own personal siren, to infant babbling, and something called a hum gradation that means, "Bear left, go left, we're going left" to direct the group. And yes, some otters have more friends than us, but let's try to forget that fact.

Chris: But yeah, the advantage for those guys is that they are in a group setting so they have kind of each other's back to try to fight off predators that might try to attack their young.

Alie: Dang! I do not want to be on the wrong side of an otter vendetta, ever. [*"I... will have my vengeance."*]

Aside: You know what? Let's try and steer this toward the positive again, okay? Life is such a bummer, it's such a bummer. But it's imperative we find the good, and we grasp it, and we clutch at it like a buoy in the cold, roiling sea, and we hug the buoy... hug the good.

Alie: What about playfulness and cuteness? Anna Thompson, Mauri Pelto, Nicole Kleinman, Michelle Tang, BeckyTheSassySeagrassScientist, Pierce Franklin, they all want to know: How cute does it get? Pierce wants to know: What's the cutest thing you've ever seen an otter do?

Chris: [*laughs*] The cutest thing I've ever seen is probably just a little baby sea otter pup that's just floating by itself waiting for its mom. I know I told you about how it's waiting for mom to bring up dinner, essentially. But before that, it's just floating by itself like a little cork, closed eyes, all fluffy and like, just, "Look at me, I'm so adorable." It's got 10 photographers along the coast trying to take its picture, including me, it's adorable.

Probably the most playful time I've seen otters are actually river otters. They actually play, they will swim next to each other, go up and down, or just run all over the place. I've seen that in river otters, but I've never really seen that in sea otters.

Alie: Rhona Taylor, Anne, and Kate Timms all want to know: why do they love ice so much? In Kate's words. And Rhona wants to know: Do they get cold??? We have otters in our local river in Scotland and it's magical when you see them but oh boy, it gets so chilly. How do they stay warm in an icy river?

Chris: Yeah, so sea otters have the densest fur, I think of all mammals. So basically, sea otters have no fat on them whatsoever; they're really reliant on that dense fur and it does keep them

warm, super warm. That's why they're able to tolerate living in all these freezing, frigid environments just fine. I would imagine river otters also have similarly dense fur, that's why they're able to live in Scotland and all these other cold places and play in the snow.

Aside: That's right! Sea otters, unlike most marine mammals, do not have layers of blubber. This was news to me, and it's also why their fur is so soft, up to lustrous 165,000 hairs per square centimeter. Eurasian river otters, about 70,000 hairs per square centimeter. What about us? A species that has fewer friends than otters? We only have 124 to 200 hairs per square centimeter.

Alie: Talking about the business end of one, Francesca Huggins, Miranda Panda, Claire Johnson, and Specs Owl all would love to talk about their poop and several people wanted to know what they smell like. Francesca asked: I heard that otter poop smells like violets. What in the otter shit, is this true? Why? Claire says that they went to the zoo and the guide said that otter poop is noteworthy, but then said nothing else. So, what is noteworthy about otter poop?

Chris: I definitely have never heard otter poop being described as violets. *[both laugh]* I've never smelled otter poop, but I'd imagine it smells like the worst shit you could ever smell because they're eating seafood, like raw seafood, and that doesn't smell good. *[both laugh]* So, I don't think I ever want to smell it. I've never smelled it, but I imagine it would smell like the worst thing you could smell.

Alie: Right? That's what I would think also. We had a scatologist on who works at the Chicago Zoo and just has 13 freezers full of different zoo animal shit, so I may have to ask her.

Aside: But first, I asked the internet about the smell of an otter turd, which is known scientifically as a spraint, and it can be accompanied by a musky gloop known as anal jelly. And Ian Craft, of the website *Total Ecology* writes, "When fresh, spraint emits a distinct sweet odor that is not at all unpleasant." And our friend Tyus Williams, AKA, @ScienceWithTyus on Twitter said, "It's similar to the odorously pungent waft of dog poop but laced with a fishiness of their marine diet." And Dr. Dani Rabaiotti, author the best-selling book, *Does It Fart?*, told me, it's acrid and fishy, "like a tin of anchovies in oil were left in the sun for four days, and then a bunch of musky man perfume was sprayed on top of it."

I also saw that Twitter user, @ForesterSujita... described the smell as similar to jasmine tea. Others said, herrings in an ashtray, freshly mown hay, lavender. But no one's firsthand account topped that of Jim Manthorpe who penned the BBC Op-Ed, "The delicious scent of otter poo." Which contains this journey of a paragraph:

Otter spraint is one of the least offensive smells in the world of excrement. It has a slightly fishy, pungent odor. It is a delight. Whenever I see it, I plant my knees in the grass, lean over, and draw its delicious smell into my lungs.

Okay, Jim.

I need a fact though, not opinion. So, I reached out to Scatology guest, Rachel Santymire, AKA, Dr. Poo and she responded with alacrity, bless her, writing me:

Otters live in and around water, so they eat fish among other aquatic and non-aquatic species. So, otter poo can be quite smelly. After reading, "The Delicious Scent of Otter Poo," it seems to me that otter poo reminds the author of the sea. Think about when you go to the ocean, and it smells a little fishy and salty. Smells like the ocean, a place where you want to be, a place that reminds you of summer vacation, sandcastles, body

surfing, being with your family, and relaxing. So, even though otter poo is smelly, it reminds the author of something they like and where they want to be.

So y'all. Long as it doesn't anyone, find your joy. Cut bangs, text your crush, sniff on a spraint.

Now, what do you do if you would like to use different holes in your face to experience an otter? Any tips on seeing them rather than sniffing? Patrons Kate Aylward, Shayla Zink, Kelly Semon, Winnie's a Witch, and Miranda Panda all desperately wanted otter spotter tips.

Alie: What about some of the fieldwork that you have gotten to do? There are several folks, and I'll list them in an aside, who want to know if you have any tips for spotting them in the wild? Do you get to get out there with, you know, fleece and down vests, and binoculars, and get out there to look for them?

Chris: Yeah, so I've gone out a couple times. I was primarily trying to film their tool-using behavior so we could try to quantify the kinematics behind it. So, I mean, I guess you could technically call it fieldwork, but it's basically, you go to the beach and have a little camping chair, set up the camera, and just hang out there until you see an otter that's close enough to start filming or take photos of it. It's California so it's like, what, a nice 70-degree, sunny day... can't complain. It's obviously very rough field work.

Alie: Yeah, that sounds absolutely terrible. I hope you don't have a sandwich or anything, or a nice, cold beverage, like ugh, that's awful.

Chris: No, I usually go with a chocolate croissant.

Alie: *[laughs]* That sounds like the best thing ever. BeckyTheSassySeagrass scientist again, wanted to know: Is a group of otters really called a frolic? And if not, can you make that official? Is that real? Are they called a frolic?

Chris: I've never heard of that, but I like it. It makes sense.

Alie: Okay. Well then good, it's called that now.

Chris: Yeah, if we all just start using that, it'll eventually catch on, I think.

Alie: Yeah, it's hereby known as a frolic.

Aside: *[record scratch]* Horrible news again. I'm so sorry, we jumped the gun here, it's already got a name and it's not a frolic. A group of otters is called a romp, on land. In the water, it's called a raft. And I searched for literally hours. Nowhere in the literature could I find any mention of them being called a frolic. Romp goes back to the 1400s when there was a tome called *The Book of Saint Albans*, and it listed plural nouns for different animals, including... Let's just do it, let's list a couple: an embarrassment of pandas, passel of possums, a conspiracy of lemurs, a committee of mongooses, a thunder of hippopotami, and many others including, a grumble of pugs, perhaps grouchy from having a vertebra stolen.

But nature writer Nicholas Lund has gone on record and reported, "No, these terms are not widely used scientifically, no matter how old they are." But romp is legit, it's established. If you were to visit the Wikipedia page, "List of Animal Names," I'm telling you right now, the lead image they have on the page is of a sea otter. So, romp it is, sorry babies.

Alie: Amelia Frank wants to know: I always hear on nature shows how vital it is that otter moms keep their babies dry – but then like, they hold them on their bellies and there is inevitably some flipper or tail dropping in the water. So, do they have to keep them 100% dry, because

that sounds anxiety-provoking? Amelia says. Should they not get soaked? Can you get them wet or is it like a gremlin?

Chris: *[laughs]* No, they're definitely waterproof, they can get wet. The reason why the mom is trying to dry it out is just to conserve heat. It's also cleaning the fur. So, otters spend a third of their life just cleaning, grooming because they rely on that fur as insulation, they have to make sure that it's clean from all that dirt and debris or whatever to make sure it's actually functioning so that fur doesn't clump up and expose its skin to the cold environment. So, they really want to get those pups nice and clean, and usually, it also happens to dry them out.

Alie: Okay, all right. So, it's definitely not like if a drop of water gets on this, you're screwed forever?

Chris: Right. Yeah, sea otters are born to be in the water.

Alie: Courtney K wants to know if river otters actually have a communal "toilet"? Do they have like, middens?

Chris: I think so but don't quote me on that. What river otters do a lot though is that they'll mark territories, so they'll basically leave scent marks all over the place and they might go to the same location all the time to make sure that that's the boundary of their territory. So, maybe that is related to that.

Aside: The otter potties, side note, are called latrines and they are considered to be hangout destinations, where dude otters catch up and exchange information kind of like walking onto the set of *Cheers*, but instead of brewskis, it's poo... it's pooskis. Also, speaking of chilling, I feel like this is an appropriate place to inform you that an otter's den is also called a couch.

You know what, let's talk teeth. Patrons Jessi B, Jesse Hurlburt, and Aven had questions.

Alie: A few people wanted to know about their teeth. Anna Zimmer says: I recently heard an otter CHEWING. I was tens of feet away across the water and could barely believe my ears. Tell me about their chompers!

Chris: So, sea otter teeth look very similar to ours, at least their molars; it's nice and big and flat, perfect just to crunch things. Often, if you go to where sea otters and you're really quiet, you can actually hear them crunching on that hard shell and it's actually pretty amazing. And what's super cool about the sea otter adaptations is that their enamel on their molars are actually fracture resistant. So, they've evolved to be able to sustain all that fracture forces from the prey they're eating. If you imagine you were trying to eat through clam shells, your teeth would get destroyed, like instantly. *[laughs]*

Alie: Oh, you'd be so fucked. Your dentist would be like, "Thank you." What makes it fracture resistant? Do they have a ton of people in, like, DARPA trying to figure out otter teeth so they can make better weapons or something?

Chris: I don't know about that but there are people that have looked at the material properties of those teeth and I don't remember exactly what minerals they have. But they've done comparisons with ancient humans that had much bigger jaws and bigger molars to crush those types of seeds as well and it's very similar morphologies, and it's pretty impressive. So, it's kind of through convergent evolution that these types of molars have evolved to be perfect teeth to crush things.

Aside: For more on this, you can see the 2009 paper, enthusiastically titled, “The remarkable resistance of teeth” which straight up compares the strength of a human molar to a sea otter’s. And humans, maximum load, 87 pounds of bite force. Otters, over 100. More than a cheetah, almost as much as a wolf. But how do sea otter molars not split while they’re chomping on clam shells? Oh, they do, they do split. But this paper said that their molars and ours, crack all the time in micro fissures and then proteins rush in to spackle them. But still, don’t eat rocks. On the topic of hardness...

Alie: What about the hardest thing about your job? The hardest thing about being an otterologist? There’s got to be something that sucks.

Chris: *[laughs]* There’s just so many things to learn about them, there’s just not enough time. We know so much about sea otters, relatively, just because they’re easier to study. In terms of the other otters, especially the ones that are in Asia or South America, those ones are much harder to study because of their locations and because their population sizes are either shrinking or we have no idea.

There’s actually another otter species down in South America called the marine otter and it looks like a river otter, but it actually lives in a marine environment too and it actually eats a lot of hard-shelled prey too. But we have barely any idea of what exactly it’s doing, what its population size is. But it might not be doing well just because there’s not a lot of work done on them in remote locations.

Alie: What do you love the most about them? What do you just fall in love with when it comes to doing this work?

Chris: They’re just such interesting animals. The fact that they have this integration between their tool-using behavior, their morphology is unique compared to other things. It’s just interesting that they are able to gain access to these harder prey.

One thing I didn’t touch on is that in Monterey Bay, these otters actually exhibit dietary specialization. Some otters will only eat urchins, others will only eat clams, and others will only eat crabs and so on. Part of my research now is trying to investigate why that is, or how they’re actually able to eat these different types of prey. How is it relating to the tool-using behavior and how is it relating back to their variation and their biting ability? Are some otters just able to generate larger bit forces than other otters? So, those are the types of questions that we’re hoping to be able to answer soon.

Alie: Is that regional, like little pockets? Or is it completely individual like one sister might be eating urchins while a brother is eating clams?

Chris: Yeah, so right now that’s... I think primarily found just in California and it goes back to that carrying capacity. Because that population is limited in terms of resources and food, instead of each individual being a generalist, eating everything they can get, they just become super specialized and get really good at eating a particular prey. So, one individual will just become a really good urchin specialist and with an urchin specialist, there’s a certain way you have to extract them, certain way you have to open them and eat them, versus an abalone specialist, which uses completely different behaviors in order to get the abalone and eat it.

So, they just become these really highly specialized individuals that really are able to get access to these different prey items and do it so well and efficiently and that’s just the way that they can increase that caloric income versus being a generalist and eating everything they see.

Alie: Yeah, that's so funny. That's absolutely me eating scrambled eggs for dinner, like, "Eh, it's fine." [laughs]

Chris: Yeah, once you know how to do it, just go for it, right? Why learn something new?

Alie: Yeah. I love the idea of someone peeking through my windows being like, "Make a note, she's having scrambled eggs for dinner too."

Chris: Well, that's the thing with these otters that they're flipper tagged so people can actually ID them and usually the Monterey Bay Aquarium has lots of volunteers to go out and observe these otters on a daily basis. So, they're basically, if you were out there, they would be tracking, how many eggs did you use? [Alie laughs] How did you put any salt? Did you use a fork? How did you cook your eggs? So, they're basically tracking all that information: how many prey items they're eating, what kind of prey items, an estimated size of those prey items, whether they use tools for that prey item? It's pretty nuts. It's pretty amazing data.

Alie: Wow. I bet the people who have to organize the volunteer staff at the Monterey Bay Aquarium, they must get so many folks who are like, [urgent, enthusiastic voice] "If you need a volunteer to watch the otter, I'm available, I'm available!" [laughs] That's got to be a long list of volunteers.

Chris: Right, I mean, who doesn't want to spend a nice morning hanging out by the coast and watching some sea otters eat their breakfast?

Alie: Meanwhile, someone is watching you being like, "Dr. Law is having another chocolate croissant. We don't know why." [both laugh]

Chris: Yeah, I mean the otters could just totally be watching me back.

Alie: I hope they are. Thank you so, so much for being on. This is a joy... Yeah, I hate otters more than I thought.

Chris: [laughs] Thanks for definitely having me on.

So, ask smart people shameless questions, as always, and then just sit back and reel in horror. You can find Dr. Chris Law on Twitter [@Chris J Law](#) and you can enjoy otters from a distance, you can enjoy them online. If you sniff a spraint, I'd like to hear about it. I don't know if I do... actually I do want to hear about it, I do want to hear about it.

We're @Ologies on [Twitter](#) and [Instagram](#). I'm @AlieWard on both. [OlogiesMerch.com](#) has bucket hats, has T-shirts, totes, bathing suits, all available. If you happen to get one, #OlogiesMerch and pictures and we'll repost you. Also, thank you to every patron who makes this show possible at [Patreon.com/Ologies](#). It costs a dollar a month to join and then you can submit questions.

Thank you to Erin Talbert for adminning the *Ologies* Podcast [Facebook group](#) with assists from Boni Dutch and Shannon Feltus of the comedy podcast, *You Are That*. Thank you, Noel Dilworth for all the scheduling, so much help. Susan Hale handles merch and so much more. Thank you to Zeke Rodrigues Thomas and Mercedes Maitland of Mindjam media for making *Smologies* episodes, which are classroom-friendly, filth-free, short versions of classics, up for free in the feed and at [AlieWard.com/Smologies](#). Emily White of The Wordary makes our professional transcripts and Caleb Patton bleeps episodes. Those are available for free on our website at [AlieWard.com/Ologies/Extras](#). Kelly R. Dwyer makes the website and can make yours. Nick Thorburn made the theme music. And editing was done by the quite handsome, writer and published poet, Jarrett Sleeper, who just debuted his first ever book, it's called *100 Poems*, I'm

putting a link in the show notes to it because he has a gorgeous, beautiful brain that strings together words so well. *100 Poems* by Jarrett Sleeper, I'm so thrilled about it, I literally could cry.

If you listen to the end of the episode, you know I tell you a secret. This week, it's that we fought off COVID, so that's good. I'm still back in LA for a little bit since my dad was feeling stronger and we were just hovering too much in the last few weeks... maybe been the most anxiety I ever have felt in my life, but we're taking it day by day. I've also taken up pickleball, and by that I mean I've played it one time and I liked it. It's kind of like outdoor ping pong but on a small tennis court and with a Wiffle ball. And it makes a very satisfying "thwack" sound. Also, my dear friend and recent LA transplant, Cole Imperi from the Thanatology episode has started a Northeast LA Pickleball club. So, I look forward to relishing my future opponent's defeats... stay tuned for that. Okay, take care, be nice to each other. Okay, I love you. Berbye.

Transcribed by Aveline Malek at TheWordary.com

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