Malacology with Jann Vendetti
Ologies Podcast
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Oh hey, it's your aunt's innocent work crush, Alie Ward, back for another episode of *Ologies*. It's time for us to come out of our spiral shells and give snails a whorl. This episode is a big, drippy bag of happy surprises. I have learned so much from snails and their origin stories, their adaptability, their non-binary outlook on life. It's inspiring. I think I love them even more now. I really love snails.

But first, and I'm going to say this quickly, thanks to all the patrons making the podcast happen and letting me keep it ad free since the start, on purpose, so far. Patreon.com/Ologies is where you can submit your questions to ologists before I even record episodes. Also, if you want to support by having *Ologies* swag on your actual, physical body, you can go to OlogiesMerch.com, and through July, I'm having a summer sale on everything in the shop. 10% off, so browse, load up, buy some gifts, hoard some things for doomsday. The code at checkout is CampOlogies.

Also, thank you to everyone who rates and reviews and subscribes, keeping *Ologies* up in the science charts so other people can find it. If you listen regularly you know Uncle Alie creeps your reviews. To prove it, I read one aloud each week, and y'all, I got my first shitty review. Two stars! I mean, it *is* better than one. Subone [phonetic] called it, "A cute, commentary track on science subjects with the occasional interesting question thrown in," and didn't like that I had asides on tangents, like, about rap music. Okay, that's fine, and no, I won't stop. But thank you to all of you who always leave nice reviews, like Nic Silver Fan Girl [ph.] who said that *Ologies* is like if PBS allowed swearing. I'm like, "Nice!!" And don't worry, I swear a lot more later.

On to malacology. The study of mollusks! Malacology comes from the Greek word (ready for this?) for 'soft animal', and it deals with mollusks ranging from snails and slugs, and bivalves, octopuses. There's so many mollusks! Malacology really is an umbrella term that covers so many, but there are subsets, like the amazing teuthology. There's an episode on that about squid. It's great. She's great.

Now there isn't a specific snail ology. Limacology is the study of slugs. Slugs get their own ology but snails don't get their own? For this episode, which is just a carnival of slug and snail facts, we're going to go with the curator's title of Malacologist. This ologist is just wonderfully charming. She's informative, and passionate, and frank. I was so excited to head to the Museum of Natural History in L.A. to hang out in her office, setting my iced latte down on a coffee table that turned out to be a slab of fossils and shells in rock, millions of years old! When she told me, I was like [*sharp inhale*] and I asked if I should use a coaster, and she said very dryly, "Nah, it's survived a long time through a lot worse." I mean, she's got a point.

I love the NHM in L.A. and volunteering there 100% changed my life. I am thrilled every time I walk into the marble foyer and see everyone in vests and badges and kids running around and people looking at dioramas. It's one of my favorite places, so I got up early and wore something comfortable but cute and I made extra sure to be there on time. But there was one issue.

> **Aside:** [*sluggishly*] Today the forecast is 111 degrees. [*theme from The Good, the Bad and the Ugly begins*] I'm walking three blocks from the parking garage to the museum and I had

to rest under a tree halfway there. I'm going to die. What if this is how I die? I die walking three blocks in L.A. to go interview a snail expert. If that's how I go, that's how I go. [*music ends*]

Spoiler, I lived! But we got to her office and had to decide whether to weather the weather or keep the AC going. We turned it off for sonic reasons and we made it through. What resulted was a truly wonderful discourse about the most shocking and erotic mating rituals I have heard in quite some time. There's gardening tips, evolutionary puzzles, there's some Gold Rush lore, snail slime as a beauty mucus. By the way, in line with the Rhinology episode, mucus is one word I can't deal with so all the F-words are kept in but I'm bleeping out the M-word. That's just what I do. Plus, how to grapple with your desire for a giant pet snail. Get ready to slug around with snail expert and malacologist, Dr. Jann Vendetti.

Alie Ward: I feel like we might actually die, because I don't want to have to call the coroner in the middle of this interview for either one of us. I don't want my ghost to call the coroner. It *so* is the hottest day.

Dr. Jann Vendetti: And there is no camera, so it doesn't matter where I'm sitting and what I look like and what I'm doing.

Alie: Yeah, you could not even be wearing shoes or pants right now and no one would care. I oftentimes record my narration just braless; it's the best thing about podcasts.

Aside: Jann has worked as the Malacology and Invertebrate Paleontology Collections Curator at the Natural History Museum of L.A. County for three years. I like to picture her behind the scenes as the Malacology Queen wearing a stiff, brown, circular cape and a crown with bejeweled eyestalks, but she was just down-to-earth in khakis and a grey shirt. Imagine if Anna Kendrick were playing a really cool-ass museum scientist. Before she landed in L.A., Jann got a Bachelor's in Biology and Geology and a PhD in Integrative Biology at Berkeley before making a glistening path into the garden of professional malacology.

Jann: I did my bachelor's degree at Colgate University in upstate New York and I double majored in biology and geology so that gave me a lot of crossover with paleobiology, which is what I was very much interested in. So, ecosystems, mostly marine ecosystems from the past and today. Normally paleontology is with rocks. The organization goes, "Dead things in rocks go with rocks, not with the things that are dead in them," so they don't go into a biology department even though you're studying the biology of these things that are dead, often.

I was interested in paleontology from a more biology perspective, a more paleobiology perspective. UC Berkeley was the only place that had paleontology that was being studied by people who trained as biologists, so I went there and got my PhD there in Integrative Biology and then came down to Los Angeles to do a postdoc in sea slug phylogenetics: sea slugs and their relationships to each other.

Aside: I mean, as one does. And then, of course, came the job at the museum here in blistering hot, scorching L.A.

Jann: I stayed in L.A. and so now I'm in L.A.

Alie: Now you're here!

Jann: If all goes well, I will stay here, which is a surprise because I never thought I'd be in Los Angeles.

Alie: When you think about L.A., it seems so arid. It's amazing we even have snails.

Jann: Right? Originally, I studied marine gastropods. But then this museum had a real push for community science or citizen science in mostly terrestrial biology (animals that are living on land) so that shifted my research focus to terrestrial gastropods, which are slugs and snails, and mostly the species living in urban environments, which almost nobody's done any work on.

Alie: I saw that on the website! I was like, "You deal in urban malacology," which is *so* badass. I love that there's, like, city snails on fixed-gear bikes and buying $6 coffee.

Jann: They're hipster, right? They're never going to buy their houses because they spend all their money on avocado toast. [*ba-dum-TSH!!*] Almost nobody's studied them, and there's this interesting phenomenon called synanthropy. Something can be synanthropic, which means that it lives near, or in, or because of human habitation. So human disturbance of an environment is good for these species.

Aside: So yes, some species actually benefit when big, stupid, naked apes have gone in and torn up land to make houses and lawns and golf courses because there are resources that wouldn't otherwise be there. [*echoing*] If you build it, they will come and hang out on your plants.

Jann: This is sort of the tale of invasive or introduced species, which aren't necessarily the same thing, but if you have a species that is living somewhere that it did not evolve, often, those are taxa that are really good at living in multiple, different places. They're very generalist or generalist feeders or they're just very good at living somewhere that wasn't exactly the environment where they evolved. So, if you find a slug in Los Angeles, nine times out of ten it is not from here.

Alie: Of course not, because the lawns aren't natural here. We're a bunch of scrub brush. What are the snails going to do here? But they're like, "Ooh, look at this lawn in Beverly Hills."

Jann: That's right. They do. There's a bunch of snails that we've been documenting, introduced taxa, which like I said, almost nobody's been documenting. USDA cares about that for reasons that we should think of as sort of obvious given the amount of produce that comes from California. If some of these invasive or introduced snails were to get into the Central Valley, that would become a big problem for various exports, both domestic and international. There's some snails and slugs that are harborers of or vectors for diseases.

So, things that we care about from a pragmatic perspective, but then also from an evolutionary biologist's perspective, it's interesting to me how these animals, whatever they are, are living in places that they didn't evolve. How are they interacting with the rest of the environment? Who's eating them? Who are they eating? Do they have any life history changes compared to the population that they came from? What effects are there of something called genetic drift?

Aside: For more on genetic drift, which is kind of like rolling a 20-sided die in terms of DNA, listen to the evolutionary biology episode and then go out and then say to a snail "Hey dude, you made it." Whoo. It's crazy.

Jann: All sorts of fun things that we can ask once we sort of know who the players are and where they are. That's still where we are now, trying to figure out which species live here and where.

Alie: My first question is why [*queasily*] snails?

Jann: Why at all?

Alie: Why gastropods?

Jann: [*laughing*] Why anybody?

Alie: No, like, in you. At what point were *you* like…?

Jann: "This is the group for me?"

Alie: Yes, because they're so cool, but at what point were you like, "I'm going to be a malacologist. It's happening."

Jann: Well, for any young person who's looking to become a malacologist, they should know that there are no malacology programs in the U.S. or really anywhere, as far as I know. So, it's not a path that has been tread by ancestral generations of scientists.

Aside: You gotta make your own slime trail, future malacologists, because instead of there being programs about mollusks specifically, you come at it from the side. Like a side door, like, [*extra casual*] "Hellooo. When did you get here?"

Jann: How did I become that? Because there was no program to study it specifically, I took courses in invertebrates, so paleontological-focused courses. It sort of just so happened that I ended up working with somebody who did sea slugs because they were totally awesome, so I wanted to do sea slugs and that was also a mollusk.

Aside: I thought maybe gastropods would have a crappy fossil record because they're squishy as hell but, duh, I forgot a lot of them have shells, which big news here: not squishy. That's the whole goddamn point of a shell; they're squishless. Also, the way that some shells are perfectly coiled is because of math and because lopsided protein production when building their shells causes them to coil up. When one side of something is shorter than the other, it tends to twist and turn like that. But back to the shell fossil record.

Jann: They can tell you a lot about trends in evolution, in rates of change, and things like that because there are lots of them, where it's harder to do that with dinosaurs because although they're much more charismatic in people's minds, much more compelling, as skeletons they can be somewhat data poor. There's not that many of them so the data points are fewer. Whereas snails and clams and things, you've got millions and millions of data points in the fossil record.

Alie: Right? Every one that lives and dies is like, “Boop. Here's my shell. Have a look at it later. I'm going to go die, but if you find that later, have a look at it.” Did you love snails and slugs as a kid?

Jann: I liked tide pools as a kid, so I spent a lot of time in tide pools with invertebrates. I could just sit in a tide pool and that was what I was interested in, and I just stayed interested in that.

Alie: So, you did not grow up in, like, Nebraska?

Jann: No, I grew up in New Jersey.

Alie: They have tide pools out there?

Jann: No, not really. They have the shore.

Aside: [*group of women shouting*: *“I’m going to Jersey Shore, bitch!”*] Okay. Sorry. Let’s get to snails.

Alie: Let's get to the most obvious question. One million patrons asked this question so I'm just going to condense it into one of my first. What is the difference between a snail and a slug? What is the difference? A snail and a slug. Clearly one has a shell. They're both gastropods which means that they have a foot on their stomach. Right? In Latin, they're belly footers. Kind of.

Jann: Yes. I mean, that's what the term means. What's the difference between snails and slugs?

Alie: I know that seems like an obvious question.

Jann: It's a good question. I get asked that question a lot and people often think, or I've encountered people who thought that slugs are just snails that have cast off their shell like, "I'm done with this shell and now I'll be a slug."

Alie: [*incredulously*] Like it's a goth phase?! That's not how it works!! [*Jann laughs*]

Aside: I’m so sorry for the screaming. That just totally threw me because it's so cute. I love the idea that slugs maybe go through, like, a breakup and then just ditch their shells like people cut bangs.

Jann: I've explained that snails and slugs are both, like you said, gastropods, but there's lineages, multiple places, multiple times. A slug is just the name for a snail whose shell is either absent or so small that the snail cannot retract into it fully. There are things called semi-slugs that have little, almost vestigial shells, like this little, dinky shell on it that it can't do anything with.

Aside: I like to picture this type of shell as a tiny, non-functional hat, like one worn at a steampunk, Edwardian ball or like a Jean-Paul Gaultier runway show or a royal wedding, and it turns out that tiny, non-functional hats have a name. They’re literally called ‘fascinators’, which, by the by, comes from the Latin word for ‘to cast a spell on’ which comes from an earlier word for a dick-shaped amulet worn to do witchcraft. So semi-slugs, just sluggin' around in bewitching, tiny hats like, [*arrogantly*] “What's this? Yes, evolutionary biology is my milliner, and this took several million years to craft.”

Jann: It's just still there. Others have an internal shell which is like a little disc that sometimes you can even see when you're looking down at a semi-translucent slug, which we have in Los Angeles from Europe. You can see like a little disk sort of in the middle of its body and that's its tiny, little, remnant shell. So, snails and slugs are both gastropods. Snails obviously (what we usually call snails) have shells. Slugs have a remnant shell or have completely lost their shell, but they can't regain it during their life, and they have never lost it during their life. They were born that way.

Alie: So are slugs more evolved in some ways than snails because they, over generations and generations, are like, "I don't even need this shell."?

Jann: No. I'd say they're not more evolved just differently evolved. I mean it's hard to say more or less because everything is always evolving. Like every lineage is always evolving. Some gastropods have extremely elaborate denticles, you could call them teeth, that are at the margin of their apertures (the opening of the shell) which makes their bodies able to get out, but very difficult for other things to get in.

Aside: Next time you see those insane, tire knife strips near the exit of a rental car place, just think: a snail is that hardcore. They will shred you.

Jann: One might argue that that is a highly evolved trait that is an anti-predator trait or series of traits. Slugs will evolve toxins on their body that make them unpalatable. Because if you imagine a slug has nothing to… [*super slow*] It's just slugging along and it's just clearly something that something could just eat. Like a banana slug for example, since we're in California, banana slugs have all kinds of compounds on their bodies and [*mucus ding*] that has all sorts of chemicals in it that make them highly unpalatable to predators.

Aside: Oh slugs. Turning birds everywhere into feathery Gordon Ramseys. [*Chef Gordon Ramsey, "Jesus, that sauce is hideous. That is fucking disgusting."*]

Jann: That's why they can slime around without anything eating them.

Alie: [*enamored*] They can slime around. I love that that's a verb. I imagine, also, that that yellow color might be a warning sign.

Jann: It might. Some of them are brown, so it seems like some of them are using color for camouflage, but some of them are bright, which yes, might be like warning coloration saying, "Don't eat me, I'm disgusting." There are people who their whole research program is banana slugs because they're really weird and fascinating.

Aside: I got thirsty for some weird banana slug facts, like maybe they like the sound of whistling or they're all Sagittariuses, but what did I find? That their scientific name means 'big penis' and their members can be the length of their entire body, sprouting from their heads, and they can chomp off another's penis like, "Okay, you cool? You done with that?" Boy howdy. Woooh! This convo's about to take a turn.

Jann: I can tell you the weirdest thing about slugs in general: they have highly elaborate reproductive morphology.

Alie: That was one of my first questions.

Jann: Which to be very specific about that, they have giant, elaborate penises. [*wolf whistle*] That's what they've got.

Alie: My first question is why, why, why snails? My second question is: [*sparkly chimes*] Lovemaking? [*cartoon boing*]

Jann: All snails and slugs (terrestrial), the very vast majority have both male and female reproductive parts; we call that hermaphroditic. When they mate, they usually will simultaneously impregnate each other, which means that their giant penises, or not always giant but they can have very elaborate reproductive systems, specifically penises, to get the job done. Then they both leave that mating encounter and go off and lay fertilized eggs.

It's a very efficient system. You don't have one sex that cannot lay eggs. Both sexes can do both things. It's very efficient. And for a lot of reasons, they've evolved these very elaborate reproductive… It's even called courtship. Different species will follow each other around in very stereotypical ways and touch each other and then [*super slow mo*] slime around each other. And this is something that is somewhat new to me because it's not what I originally studied, but I have studied it since working here. It's fascinating and strange and wonderful. If you wanted to find the best video ever, if there can be such a thing: David Attenborough narrating leopard slug sex. *Limax maximus* is the species. It's called the leopard slug.

Alie: More like climax maximus. [a*ir horn*] [*deep male voice, "Ohhh, yeahhh."*]

Aside: I was looking all this up in a Chicago coffee shop this week, and I had to angle my laptop screen because technically I was watching slug porn in public. And I won't lie, it was very sensual. Here's how it works: One slug is DTF and leaves a saucy, little trail of pheromones and another slug smells it and is like, "Heeey. Wait up bb." [*clip from Life in the Undergrowth Episode 1: Invasion of the Land: David Attenborough, "The pursuer, to confirm that it's there and ready to mate, gives the pursued a nibble."*] The pair climbs a tree, and then they wrap themselves around each other and they descend on a cord of thick slime. They kind of drop down and hang like a Moroccan lantern at a bohemian-styled Airbnb.

Jann: [S*oft, beautiful, harp music begins playing*] They'll intertwine themselves and make sticky m* [*ding*] and then slide down a m* [*ding*] string from a tree and wind themselves around each other, and then extend their giant penises that intertwine with each other and are blue and translucent. It is wild. [*music continues, David Attenborough, "They fan out to form a translucent, flower-like globe. And now, at last, sperm passes from one slug to the other."*] David Attenborough does a very David Attenborough job of describing this incredible phenomenon.

Alie: With, like, warm objectivity. It sounds like if you went to Electric Daisy Carnival and you had a really wicked hallucination.

Jann: [*laughing*] Slugs with blue penises! Yeah, they do all sorts of weird stuff.

Alie: Why do they have such a monster dongs?

Jann: Well, there's probably a better answer than I can give, but the answer that I can give, which sort of partially answers that question, is that species differences are what your

reproductive parts look like, which are on the inside most of the time. When there's reproductive isolation… When one group becomes isolated and then over time they accumulate differences that then make them different enough so that if they were to ever encounter that other species, they wouldn't be able to mate, for whatever reason, their reproductive morphology evolves relatively quickly, more quickly than their body structure on the surface.

If you look at what looks like one species: it's a black slug with an orange foot. All right, it can look that way, and there can be a whole bunch of species that look the same way, but inside, the reproductive morphology or their penis morphology is very different. So that means that they are now reproductively isolated from each other. That keeps them reproductively isolated or as one distinct species from these other species.

Alie: That makes sense.

Jann: It doesn't exactly answer your question. It doesn't exactly answer why.

Aside: So, slugs: tiny shell or no shell, but big dick energy for days, probably because they don't have the expense of making a shell. I really don't know.

Alie: Now let's talk a little bit about "anyone can get pregnant," that it's just a knocked-up free-for-all. Why don't we have that in other species, please?

Jann: One, to answer the first part, why are more organisms not hermaphroditic or have both male and female reproductive parts? Part of it is that there is an advantage, but a bigger disadvantage to self-fertilize, so sometimes if you have both parts, you can fertilize yourself.

Alie: Oh my god, that's so narcissistic.

Jann: Then you can make offspring that you are both the mother and the father. They're not clones, but they are your offspring with no partner. That can be problematic because you don't get variations. The scientific consensus generally is that if you are self-fertilizing, that's not a great system in the long run for genetic diversity. When environments change, you always need genetic diversity otherwise your lineage will just go extinct.

The more genetically diverse, not in all situations but in most, the more genetically diverse you are as a population within a species, the better you are essentially equipped to handle environmental change. If things change, your environment changes, some individuals in that group will be able to survive and then have offspring, so that's usually a good thing.

Aside: Diversity helps make populations stronger. If certain political powers were as intelligent as slugs, they could comprehend this.

Jann: And why not more hermaphroditic? It's just possible that it didn't evolve in some groups and the groups that it did evolve in, sometimes it continues. It seems like sometimes hermaphroditic reproductive systems continue to be how that system evolves or that species evolves. But anytime you have any mutation that changes, that knocks out either the female or male reproductive system, then you have one. Then that could be after that you're on the road to separate sexes.

It could be that having separate sexes is good. It's possible that you get more variation when you have males. That's usually one of the go-to explanations, that males are… I give a lecture in an evolutionary biology course that is called "Why males?" [*Alie laughs*] For the purposes of the course, the reason we have that lecture is because why would you ever have a sex that does not have eggs? Do you know what I mean? From an evolutionary perspective, why would you *ever* have a sex that can't lay eggs?

Alie: Now that's funny that it's like, "Males: what's the point?" [*both laugh*] We need someone to explain movies to us.

Jann: From an evolutionary perspective, the answer is that males provide genetic differentiation. They provide variation to the population, whereas females do too, but having males just be males, then there's all sorts of dynamics that can happen if you have males as males which by definition cannot procreate with eggs.

Alie: I guess males are just like a genetic…

Jann: Storehouse of…

Alie: Yes. Like a gamete confetti gun, you know, just get it out there. [*robotic gun firing*]

Jann: Yes, that's one way to think of it.

Alie: Meanwhile, here we are toiling internally like, [*old-timey voice*]"I made one baby."

Jann: Yes. That's a whole… That's very interesting. Like males and the number of offspring a male can have versus a female, which is totally different if you're hermaphroditic. Which is totally different because it's much more egalitarian by definition if you're hermaphroditic and you're a slug because there are no separate sexes. Everybody's reproductively the same.

Alie: It sounds like socialism, the best form.

Aside: Now, let's bone up on details about the gas-lighty romance of snail lovemaking.

Jann: One difference is in land snails. They have these structures, not all land snails have them, but the ones that do have structures called love darts. Have you heard about this?

Alie: [*gleefully*] No.

Jann: Okay. Our common, European, garden snail, I call it the wet-sidewalk snail, like if it rains, when it rains in Los Angeles, on a sidewalk you'll see a snail. It's probably 99% of the time, if you live in urban/suburban parts of Los Angeles or Southern California, it'll be this snail. It's a European snail. It's just a brownish, light brown, dark brown, mottled sort of shell. It just looks very boring. It just looks like a snail.

Alie: It's a *Helix*…? What is it?

Jann: It used to be *Helix aspersa*. Now it's *Cornu aspersum*. They changed the genus name a while ago, but that's not uncommon. Yes, that's the snail. So that snail and others, when as they're mating, they can deploy a dart. It's a calcareous or chitinous… Like if you imagine *Cornu aspersum*, a common European garden snail, is about the size of a half dollar, like 1½ times the size of a quarter in size, and it's shooting a dart. The dart is probably the length of your middle fingernail, so it's not microscopic; it's macroscopic.

They'll shoot that at each other, sometimes to the detriment of the other snail, and sometimes killing the other snail. That's not the intent of it, but what it does is it influences the body hormonally. So, I think, it's this dart that's got a lot of hormone laden m* [*ding*] around it and it influences the receiving snail, the snail that gets the dart, to impregnate, or fertilize its eggs using the sperm of the dart-giving individual.

Aside: For obvious reasons, many scholars believe that the lore of matchmaking Cupid was based on these very love darts of our horny snail friends. The individual that gets the dart is more likely to digest in its body any leftover sperm it had from a recent boning. Can you imagine if Cupid had stayed a little more true to form and instead of being a silky-skinned, human infant was actually a snail just somehow using its big, slick foot to perform some really well-intentioned, endearingly cockblocky archery?

Alie: So the dart is like a dibs, almost like an aphrodisiac where they're like, [*prissily*] "I don't care about all the other sperm I got. *This* is the one I'm into."

Jann: That's right.

Alie: [*excitedly*] It's like soulmates. It's like a soulmate arrow.

Jann: Yes. It's called a love dart. I mean, it's an aptly named part of morphology.

Alie: Is there oxytocin at play, or does that even happen in snails?

Jann: I don't know. It's a hormone, I don't know what hormones though. Someone does. Someone knows about snail hormones. I do not.

Aside: So apparently the slick goo covering this little love spear has an allohormone, which is a substance that causes the female reproductive organs to not digest the dart tosser's sperm and to also keep the reproductive tract open. It's essentially like a stabby message meant to convey, "Hey, Ima be your babies' dad in a minute. Let's put in a pin in this."

Jann: In terrestrial snails, slugs don't seem to do that as far as I know. A bunch of snails in the helicids, the helicid snails will do it, and in sea slugs, there are a bunch of different species I know of in the Sacoglossa, which are the sap-sucking slugs. They're sea slugs that some of them can incorporate chloroplasts from the algae that they eat and put it in their body where it continues to photosynthesize. That makes them one of the, if not the only photosynthetic animal. It's not endogenous. It's not that they've evolved photosynthesis, but they can use something that's photosynthetic. They're taking a chloroplast, the photosynthetic machinery of an alga, and taking just that organelle and putting it in their body, which is really wild.

Alie: That's resourceful as hell!

Jann: They can, some of those species, and other ones related to them that don't necessarily have the ability to what's called kleptoplasty, they can't grab chloroplasts and keep them…

Aside: Kleptoplasty? I will never not relate these sea slugs to shoplifters tucking chloroplast organelles into their pants.

Jann: But in that group, Sacoglossa, they have a penis with a little barb on it, like a little… It's called a stylet, like a little sword ending.

Alie: Oh no. No, thank you!

Jann: And they can go around and they're all hermaphroditic, so anyone who's acting as a male at that moment, which is anytime you use your penis, you can poke or…

Alie: Stab?

Jann: You can stab a potential partner and inseminate them that way. It's called hypodermic insemination, which is exactly what it sounds like. But every individual is able to do that.

Alie: Hypodermic?

Jann: Hypodermic because it's like… Yes, hypodermic insemination.

Alie: That's like a whole new play on needle dick insults, because you're like, "No, for real though." [*Jann laughs*] Oh my god! Are you ever at cocktail parties and someone's like, "Hey Jann, this conversation's boring. Get over here."?

Jann: I have two little kids, so I'm rarely at cocktail parties, but my postdoc advisor has been at cocktail parties and started telling the hypodermic insemination story, which as you might imagine, really gets a lot of interest.

Aside: Okay, moving on from slug dicks.

Alie: So many people have this question. Can you give me in a nutshell the difference between terrestrial and aquatic snails and slugs? What's the deal? Why can some of them hang out on land?

Jann: Sure. Terrestrial means 'lives on land' and obviously, aquatic means 'lives in fresh water'. If it's the ocean, we would normally call it 'marine'. Then from the marine realm, different lineages have evolved. Most of them, it was a big introduction *once*, or a big evolutionary innovation that one lineage evolved to be terrestrial. Then once they were terrestrial, they really sort of exploded in diversity.

There's a bunch of different pathways that they've taken to, you could call it, 'invade' these different ecosystems, and it's considered one of the biggest evolutionary innovations in the evolution of animals. It doesn't seem like it because not that many people think or talk about gastropods, but gastropods evolving, or snails evolving from the ocean to the land is considered one of the biggest evolutionary innovations in the history of life. [*air horn*]

Alie: Because it's so hard to do?

Jann: Yes. I mean your whole physiology has to accommodate oxygen and air instead of water, which is a big, big difference.

Alie: Can you imagine if the air just had floating jellyfish in it just like puffing by and it was like nothing? Like, "Oops, that jellyfish nearly hit me in the face.''

Jann: Flying jellyfish. Amazing.

Alie: What is it about terrestrial snails and slugs? Is it like a BYOM, like, bring your own m* [*ding*] on land and then just like cover yourself in a moisture layer and you're good to go?

Jann: That lets them start to survive in arid conditions at all? If you have a shell and you're marine, then you have something you can pull into and keep yourself safe and from drying out, so it's like it had two different functions. If the first function in the marine realm or where they're living in the ocean was for protection, its secondary function was to prevent desiccation whether it was necessary for that organism when it first evolved or not.

That allowed them, this is why we call it 'pre-adapt', which like I said, has some problematic implications, but the idea is that they had this trait already and that trait ended up having a really important secondary function that allowed them to make this big transition onto land. So if you have a shell, your shell can be where you can pull into and keep yourself from drying out. That's what they do. That's one of the reasons that that big evolutionary innovation could happen in the first place.

Alie: That makes sense.

Jann: But for slugs, they obviously don't have that so you mostly see slugs in wet environments, which is why you see banana slugs in parts of the greater Bay Area because you've got lots of wet, foggy, redwood forests where they get a lot of moisture all the time.

Alie: Just from the air.

Jann: Right. There are very few, only probably two or three species of native slug in all of southern California, and it's because it's dry, so you just don't find them. You'll only find them in little, tiny habitats that are probably refuge habitats that are still wetter than on the tops of mountains and places where, during the Pleistocene, there used to be a lot more water. They have these little relics of when it used to be much wetter.

Alie: Let's debunk some flimflam. Are there any myths about snails or slugs that you're like, "That is not the case, people!"?

Jann: I don't know if I'd say now that I can think of. There used to be quite a lot of snails and slugs used convergently by different Native peoples of different lands for medicinal purposes. People from, like, the Puritans, which were not native to North America, but the Puritans and Native Americans, in say the American West, would use snails and slugs to cure things. Cure like sore throats or other problems that were probably physical ailments.

Alie: Okay, like, "You've got a sore? Stick a snail on it!"

Jann: Yes, which is interesting, and that's happened around the world, and there is some research now. This is sort of like when folk wisdom ends up having some truth to it, like a lot of ethnobotany. Like, what do people think plants do? Plants are full of chemicals, so yes, they do do things and sometimes, often, people have figured out how to use plants to do things medicinally. There is some research now that slug and snail slime can be healing for human skin in various ways.

Alie: That is one of the most asked questions from Patreon. Is snail goop really good for your skin? Mads Clement, Lauren Eggert-Crowe, Kubara Lee, [ph.] a lot of people asked.

Jann: Yes. South Korea has a lot of a snail slime products. A lot of southeast Asia has a lot of snail slime products for everything from curing acne scars to just general beautification.

Aside: A quick google opens the doors into a world of gleaming slime streaks and glistening promises of cell repair and faded acne scars and hydrated under eye bags. If you're up for it, there's a procedure called EscarGlow that involves thousands of tiny needle pricks into your face followed by snail foot secretions oozed into your open wounds. It costs $375 a session, partly because we'll pay for anything apparently, and partly because "the snails are meticulously cared for and receive daily 'showers' with fresh water and a feast of fresh fruits and vegetables."

By the by, stay tuned for an episode on kalology, the study of human beauty standards and how they affect our psychology. I just recorded it, and it's fascinating and also enraging. More on that in a few weeks. Anywho, this snail mucin may possibly be effective at hydrating but, hmmm.

Jann: I did spend some time looking at the patents of some of these. I am not a biochemist, and this is more a biochemistry question, but there does seem like there could be some benefit to putting something that is water rich on your skin. But I don't know how that would be very different than like aloe or anything else that is an emollient, like something that has a lot of water in it or keeps water in your skin. That's generally going to make your skin look better, so I don't really have an answer. It does look like there is some promising research that slug or mostly snail slime can improve your skin.

Alie: It's funny though because we talk about snake oil, but literally now if someone were like...

Jann: Snail slime.

Alie: Now it'd be like, "Well, I could see how snake oil could be a sheet mask." People would be like, "Awesome! It's part of a 10-step skincare system."

Jann: I think that the problem is, well, it's not safe to just put snails on your face because they can host parasites. And I think that the ick factor is a little too much for most people, even if they were clean snails. So that's one thing. But then two, for a lot of the face masks and creams, it's not regulated. I mean this is the thing with what they call pharmaceuticals, there is no regulated amount that you have to have in a product to say that it is going to be effective. But they do it with the snail that is the Los Angeles wet-sidewalk snail.

Alie: Really!?

Jann: Yes. The patent says, and you can look them up, there's multiple patents. One of the patents has very detailed explanation of basically a salad spinner, and the *Cornu aspersum*, which is the species we're talking about is given various... I mean if you look on the labels of some of these products, it will say all these exotic names like "Chilean earth snail," like, "black something snail." Nobody is really using *Cornu aspersum* or sometimes they are, but I think it maybe ups the buy-in of people if you call it something that sounds extremely exotic, not the snail that's literally outside right now eating my pumpkin patch. Those snails are the snails they're talking about.

What they did was they put a bunch of them into a salad spinner and the agitation caused the snails to produce a bunch of m* [*ding*] as a probably protective measure. I mean, if they're in a… Imagine that that's not something that evolution has really put a big mark on

for snails because they're usually not being spun around, right? To protect themselves in some way, they produce a bunch of m* [*ding*] and that m* [*ding*] is collected and filtered somehow and then added to these products. They did test it in some various number of ways to see if it did seem to improve cell repair and things like that.

Aside: If you're looking for a less snaily, less expensive hack, check out something else with hyaluronic acid, which if you remember from the glycobiology episode about carbs, hyaluronic acid is just a sugar that can hold up to 1000 times its weight in water, and there's a lot of it in snail slime because they've got a bit of gliding to do. This next part is crazy, and I didn't know this at all.

Alie: What is snail slime?

Jann: It's mostly water. One way of describing it is as a liquid crystal. This is outside of my realm of expertise, but there's ways that it can be sticky and fluid very quickly and move from sticky to semi fluid. The ability to do that can put you in a category as a biological product called a liquid crystal.

Aside: 'Liquid crystal' means that the molecules follow orderly patterns like a solid, but it flows like a liquid. Another liquid crystal? Soapy water. Who knew? Not me.

Alie: And it just helps for mostly mobility and protection, right?

Jann: Yes, that's right. As a snail or a slug, you could make multiple kinds of slime for various purposes, so your moving slime would be different than your protection slime. The cells on your foot would make slippery slimes so you can move around or very sticky slime to stick you to something, and then your body, the dorsal part of your body, would make maybe chemical-rich, protective, unpalatable slime.

Alie: It seems risky to have essentially a trail of breadcrumbs leading to your location. Like, "Hey, everyone. Here's an actual map to find out where I'm heading."

Jann: Yes, it does. I can think of two reasons why that would be a good thing. One, it might advertise the chemicals that are in you, so you could have anti-predator slime in your foot slime, too, that says, "Predator, I smell disgusting," or "I smell extremely unpalatable," or something that makes them… But not all slugs are unpalatable, like raccoons and skunks have a field day, so some of them aren't.

Aside: I just watched a video of a raccoon eating slugs like they were a bag of stretchy, gummy candy and it was imagery that will stay with me for life. Don't watch it. Sidenote: don't eat any raw snails or slugs because they may carry rat lungworm which is a worm that burrows into your brain and can kill you. Serious illnesses have happened in a few countries and even in the southern United States, mostly in boys and young men who have been dared by friends to eat a raw slug or snail. So please don't do that. Cook them if you have to. In case the taste wasn't enough to not make you want to gnaw on alive mollusks, there's the rat lungworm.

Jann: It also can tell… If you're a snail or a slug you might have trouble finding a mate, and your slime trail may be a path to you from somebody else who would be your potential mate. It's like your breadcrumb trail that's your romantic breadcrumb trail: "Here I am!" Because they

have eyes on the top of tiny little eyestalks, they probably are not seeing very well. They're probably all influenced… Most of their senses are probably pheromones, so what pheromones do they have, do other snails have, and how do they navigate and find each other? Which is sometimes, if you're a snail or a slug, sometimes the only time you can find someone to mate with is when it rains.

Alie: Oh! [*clip from Garbage song Only Happy When It Rains: "…I'm only happy when it rains."*] [*wet splat*]

Jann: If you think of an environment where they're estivating, or they're in snail hibernation for a while, or they're underground and they're slugs and they come out at night and then they want to find somebody to mate with. They have to find them probably using these little pheromone trails.

Alie: Let's talk about their Martian, googly eyes because it's *so* weird. I feel like we're so used to it. You have two sticks that grow out of your head from moment to moment. What the hell's going on?!

Jann: Yes, they're weird. They can also pull them into their head and then pop them back out. Most marine snails don't have that. Most marine snails, their eyes are on their face and then they have little, sticking things that are sort of like their sensory tentacles, but they don't have eyes on the end of them.

So if you ever see cartoons, it's easy to tell who knows their snail biology by the cartoon because terrestrial snails almost always have two sets, an upper, optical set of tentacles and the lower, sensory set of tentacles, and marine snails almost always have at least one set of tentacles that have no eyes on the top. Their eyes are on their face, if you will, or in their head.

Alie: How are these terrestrial eye stalks even working? And also, don't they have crazy tongues?

Jann: Yes, they do. The eye is on a muscle, If you were to look at a snail and you were to poke at its eye stalk, it'll pull its eye in, but it's eye is independent of its eye stalk so it can pull its eye in on a muscle first before the rest of the stalk. It's like having a foot in a sock. Like you could pull your foot out of your sock and your sock is still there. So, they can do that.

Aside: [*through bullhorn*] Hey kiddos, don't poke snail eyes, okay? All right.

Jann: They have, I think, an image-forming eye, but there's no reason to think that they're making a lot of sense out of what they're seeing.

Alie: What about their weird tongues?

Jann: Yes, their weird tongues. Their tongues are called radula (one radula, two radulae). I tell people it's like a cat tongue, so if you imagine if you've ever been licked by a cat, it's got that really rough tongue. Their radula is like a cat tongue and the bit that makes it extremely effective are little teeth on the tongue. It's like a strip that moves in and out, and the mouth kind of shoots it out and scrapes and pulls it back in, and shoots it out and scrapes and pulls it back in.

Aside: A snail tongue is made up of hundreds to thousands of tiny, little teeth that have different shapes and sizes depending on the species. If you watch a video of a snail licking glass, it's like a tiny, wet Sarlacc pit from the 1983 version of *Return of the Jedi*, just like a hole lined with teeth. It's a miniature nightmare. Now on the topic of arid horrors, what happens when a snail gets dry?

Alie: You had mentioned hibernation, and I got this question I feel like before I even knew I was doing this episode, but why can they sometimes just hang out, sealed off in their shell for months?

Jann: Well, that's one of the reasons that the snails that can do that are good at living in environments where they didn't evolve and that can be very hot and dry that they survived because they can do that very thing. It's called estivation. It's hibernation essentially. They find a spot and they can put out a special m* [*ding*] that will stick their shell to a surface like the side of a house, and then they can pull their body back in and make another layer that covers their body and has a little hole as an air hole. Then they can sit there and wait. I have one estivating. I'm looking at it right now. It's sitting over there.

Alie: What?!

Jann: I can show you.

Alie: Yes! I see it in a jar! It's just like, "Gone fishing." I love that you just have a jar with a snail in it! How long has it been kicking it?

Jann: These had been here for a couple of weeks. I gave them water.

Alie: [*soothingly*] Hi.

Aside: Yeah, sure, I'll baby-talk a gastropod. So what? So a snail seals itself into its shell during hot or dry periods, kind of like how you would barricade yourself indoors during the summer in Arizona, and there's a tiny little hole in their sealed off slime wall, kind of like a mail slot through which you would accept air or pizzas. Even though snails are fasting.

Jann: They estivate for weeks to months, days to weeks to months.

Alie: And they don't get hungry!?

Jann: If they have no resources, they would just die eventually. They would just drown and die, but once they have rain then they'll find each other and mate and find something to eat and then go back to estivating. Once they have enough resources they'll just go to sleep and they'll slow down their metabolism and stay like that for a really long time, which also extends their lives. Like people have asked how long do they live? And I said, "They could live for five plus years."

Alie: Really??

Jann: I think so, especially if a lot of their life is just estivating so they're not doing anything. They're just waiting so they can kind of extend their lives and also live in a place that's really dry.

Alie: So, “snail's pace” is kind of legit there. How do you feel about the term ‘snail's pace’ and how do you feel about the term ‘snail mail’?

Jann: Snail mail… I don't really care. It's all right.

Alie: Do you feel like, as a malacologist who studies snails, people expect you to get things back to them slower? Just on a subconscious level?

Jann: [*laughs*] I wish that that were the case. That would be great if that were the case because that's kind of how I operate. If it were that the expectation would be that it was slower, that would be a good thing.

Alie: There have to be people who study cheetahs and people are disappointed that they don't return emails faster, just subconsciously. You know what I mean?

Jann: [*laughing*] That's right.

Alie: Can I hit you with some Patreon questions?

Jann: Yes, sure.

Alie: This is a rapid-fire round. You can answer as fast as you want. Sarah Preston, great question, a few people asked this: Where do all the shells come from? Are they making them? Are they finding them? What the shell's going on?

Jann: They're making them. I say that it's like a turtle. A turtle makes its shell and it lives in his shell and it's attached to its shell and it can't somehow like cast it off and get another one. A snail is, in that sense, exactly the same. It makes its shell when it’s a little, tiny baby; it has tiny, little shell. As it grows it adds to its shell, so it's like a turtle. A turtle is not just naked when it's born and then finds a shell. It's the same thing with snails. They make their shell.

Every shell that you've ever seen was made by a snail, and the only organisms that find shells and then get new shells are hermit crabs which are naked on their abdomen. They are these weird little crabs that have this totally naked abdomen and then grab onto a shell and hold it because they need some sort of protection.

Aside: Nude hermit crabs, by the way, are one of the most sweetly, revolting sights. Their butts look like a coiled, boneless finger and then when they grow, they sometimes have to swap shells with other hermit crabs. They line up in an orderly fashion and everyone at once moves a size up into the warm, freshly vacated shell of the one ahead.

Whenever I’m feeling emotionally vulnerable or scared to reveal something or if I’m about to risk rejection, I think of these naked hermit crab butts and how important it is to make that risk and switch into the larger shell to have more room to grow and live your life. Also, thanks to dead snails for growing these shells out of their bodies in the first place. I don’t know where that takes my metaphor, but whatever.

Alie: Snails were like, "No, I made this."

Jann: Yes. “I made this.” That's right.

Alie: Of course. “You're looking at my butt right now.”

Jann: This is their house. Yes, they carry their house on their back as the saying goes.

Alie: Dustin Mills wants to know: Are there fast snails?

Jann: [*super slow mo*] Ummm, uhhh. Yes. Fast in certain aspects, yes. Cone snails, which are famous for having conotoxins, these special toxins that they use to kill their prey, the way that they do that is they have a radula, the feeding structure that is evolved to be a spear-type shape, and they can, in milliseconds, shoot out the spear into fish, polychaete worms, or other mollusks. And that process of shooting it, like if there's a fish, you've got to be pretty quick to catch fish, so a cone snail that eats fish can shoot out this barb in milliseconds and paralyze its prey almost instantaneously and then engulf and eat it. So that's fast. That real fast.

Alie: Can you imagine being like, "Oh, what happened to Gary?" And it's like, "He got taken out by snail."

Jann: So embarrassing!

Alie: It'd be like, "Ouch dude, you lost." Brooke Pisone [ph.] asks a good question: What's a humane way to discourage snails from eating the things in my garden? Is there something like an Axe body spray I can use to disgust them and get them to stop eating my plants?

Jann: Oh, I wish there were. You can pick them off by hand and put them somewhere else, but that's a very proximate solution.

Alie: Also they're nocturnal. You got to be out there at three in the morning with a flashlight! Who's doing that?

Jann: That's right. Humane? No, not really. Beer. Like, shallow dishes of beer. They're attracted to that and will sometimes drown themselves. Not humane.

Aside: Your garden is a Lifetime movie about a frat house tragedy.

Alie: Kyle Grose and Heather Crowther both ask: What is it about beer that attracts snails in beer traps? Why do they like it so much? Have there been any studies to see if snails enjoy craft beer over domestic?

Jann: I don't know why. It could be that fermentation, something that is fermenting, smells like something that is good to eat. If you imagine you're a generalist snail and you're looking for something to eat, something that smells like it's dying or dead and sort of decomposing, which is not exactly what fermentation is, but sort of similar.

Aside: As I typed this, I was drinking this vinegary kombucha and I kept picturing snails dying into it which if you wondered how to make kombucha harder to swallow, just do that. Also, I looked it up and apparently slugs do like the yeast in the beer so if you don't want to spare a beer, some sugar, water, and baking yeast will do the trick. I watched this time-lapse video of slugs just popping off at a beer trap and a lot of them will take a sip and make off fine. They're like, "Thanks! Byeee!" But there are others who slip right into it like a bathtub filled with wine coolers and just blissfully surrender to the Grim Reaper right then and there.

Alie: Mike Monikowski, great question: Is farming *Helix* snails for escargot an environmentally sustainable form of agriculture? Do you eat snails, common snails?

Jann: I don't. *Helix,* he's talking about for escargot. There's a couple of species that are good escargot snails that I have never eaten. One is our Los Angeles wet-sidewalk snail. In addition to making the slime that's used in snail beautification products, they also are a, maybe, second-tier escargot snail.

Is it environmentally sustainable? As a form of protein, I would say probably more than other forms of protein. I mean, they can build up a lot of body mass on very few ingredients. They can also eat refuse. They could be instead of your compost bin. You could have snails thriving and eating your compost and then you could eat your snails. That was kind of how the *Cornu aspersum,* wet-sidewalk snail, was introduced to California in the first place.

Alie: Wasn't it the Gold Rush?

Jann: There was a Frenchman who in the 18 somethings… I'm not sure if it was for the Gold Rush; could have been.

Aside: Fact checked this story and yes, it's delightfully, endearingly, bizarringly true.

Jann: A Frenchman in California who asked someone in his family, his mother perhaps, to send him snails from France to California because he wanted to have a supply of snails to eat. He made an enclosure for them so he could breed these snails to have them whenever he wanted, and the little babies are just millimeters big and crawled out of the mesh or presumably whatever structure he had for them.

Then that was one of the ways that snails were first, perhaps the first way that snails were introduced to California, but this same snail has been introduced all around the world and lives in South Africa, New Zealand, Australia. It's really good at living where people live. I have a colleague at the museum who collects snails at night around Los Angeles and feeds them cornmeal for a while to clean out their system and then, I guess, sautés them up, steams them, however, and eats them.

Alie: My mom used to do that. [*with Italian accent*] My great-grandma, Noni, she used to do that. She would send my mom and my aunt up to the graveyard with a burlap sack. They'd have to take the Muni in San Francisco with this dripping, oozy sack, and then she'd feed them corn meal.

Jann: Were they in North Beach? Was this Italian Grandma from North Beach?

Alie: Yes! Literally lived in North Beach.

Jann: Awesome! That's where all the Italians live. Wow! That's amazing.

Alie: Yes. Mom said she was mortified as a teenager, you know, she'd be taking the subway with a burlap sack full of, just, m* [*ding*]. But you don't eat gastropods?

Jann: I have. Not the escargot variety but I have on a couple occasions, but I don't seek that out to eat. Not for any particular reason, it's just not really my thing.

Alie: Not your jam? Chewy. Very chewy. Skype a Scientist has a great question: Is there any good reason that I should not have a giant African land snail as a pet? *Achatina fulica*.

Jann: Yes! There are many reasons! There are many! The only places that those snails, they're called giant African land snails, which are nicknamed GALS.

Alie: Eeeeey!

Aside: GALS epitomize the 'Haters Will Say It's Photoshopped' meme. There's a picture going around of a woman cradling a huge snail and it's so bunny-like in scale, and with its two eye stalks, it really looks like you woke up in a *James and the Giant Peach* alternate universe where all rabbits were replaced by snails. It's so cute but also horrifying, and you'll find yourself just staring at it and questioning reality.

Jann: GALS are potentially highly, highly invasive and highly destructive in environments where there isn't a cold winter that can kill them off. So yes, the short answer is you should absolutely not! And if you do have them, the answer is not, "Oh my gosh, I have them. I'm going to let them loose in Echo Park, and then I don't have them anymore."

The answer is contact me at the museum or somebody from USDA, and you can give up your snails with impunity. I believe you can say, "I have these. I'm not supposed to have them. I'm not going to let them loose in Griffith Park or anywhere else. I'm going to give them to you, somebody who's going to deal with them so that they do not become an agricultural pest."

Alie: It's like leaving a baby at a fire station. You are a safe haven.

Jann: Yes, that's right. You are allowed to do that. You need to do that for everybody's benefit with GALS, because they could become a many, many, multi… Like, tens of millions of dollars easily in eradication efforts in California if they were to become established. Florida is dealing with populations of GALS that are highly, highly destructive and can also carry certain parasites that can cause meningitis.

Alie: Ooo! Yes, that's a hell no!

Jann: So yes, there are reasons that for health reasons you wouldn't necessarily want to have them.

Alie: I have an idea. What if you just get a hairless Chihuahua, and you put baby oil on it and put a hat on it and you pretend it's a GAL?

Jann: You could. That's right. I bet somebody has done that.

Alie: I fixed it!

Aside: Even though that "Hey, should I get a pet snail?" question maybe wasn't a 100% serious, really though, nobody get one! It's like a very slow-paced movie about how the apocalypse started. Spray some Pam on a hairless cat and then make it a decorative fascinator hat. Call it a day. Now that I fixed the world's snail problems, lets wrap this up.

Alie: What is the suckiest thing about your job?

Jann: Suckiest thing? I wouldn't say it's sucky, but like a lot of jobs, there's a lot of sitting at my computer and doing writing and emailing and just general sit-at-your-desk kind of work. There's a small part of the job that is going out and collecting or being in collections. That's one of the cool things about being at a museum is that if I want to go into the field, as it

were, my field site might be down the hall in the malacology collection opening drawers in the collection.

I always like that part to be more than it is, but as it ends up, there's a lot of time that's writing, revising, doing analyses, trying to figure out how to get analyses to work, trying to figure out how to do something analytical to answer a question. It's not the times that we're out doing expeditions. That's all very exciting, but not so much the sitting.

Alie: What is your favorite part about your job? Or do you have a favorite moment in malacology where you discovered something, or you were in Hawaii on a bluff and found a species? Anything crazy like that happen?

Jann: I would say it's not one moment. I think a lot of scientists, if you get to do the work that you like to do, and this sounds sentimental and I don't mean it to sound as sentimental as it's going to sound, but every day, almost literally every day, there's something new that I learn that is amazing to me. I understand it wouldn't be amazing to everybody, but I think that you know when you're in the right kind of job when something that you encounter as part of your job is awesome. Like, "This is amazing, and I didn't know anything about that."

I've had training for a decent number of years, I've worked on a bunch of different species, and still, there are so many stories about evolution that you can see in organisms that are just absolutely breath-taking. In that sense, it's really amazing. Everyday there is the potential for something to be absolutely mind blowing. And that's opening a drawer! Evolution is my absolute favorite thing to think about and talk about and write about, so it's just amazing.

Alie: That's great.

Jann: Sentimental.

Alie: No, I love it. Come on. Get snailamental. It's wonderful. This is amazing. Oh my god, thank you so much.

Jann: You're welcome.

So, just keep asking smart people stupid questions because how else does anyone learn anything ever? Really. Just being curious is the smartest thing you can do. To learn more about Jann Vendetti, you can see her in interviews with *Ologies* ichthyologist guest, Chris Thacker. We all love her on her NHM web series, *The Curiosity Show.* You can also follow along with the Citizen Science malacology roll call where they go out and count snails in L.A. Just check out #SnailBlitz. There's also the SLIME project at NHM.org.

Ologies is on Twitter and Instagram @ologies. I'm on both @AlieWard. There's shirts, bathing suits, hats and tote and pins at Ologies Merch.com. Thank you Boni Dutch and Shannon Feltus for managing that. You can join the Ologies Podcast Facebook group for nice people and weird science. That's moderated by Erin Talbert and Hannah Lipow. Thank you, admins. Thank you always to Steven Ray Morris. Music is by Nick Thorburn of the band Islands.

If you listen to the end of the show, by now you know that I divulge a secret, and this week: when I go to the movies with my friend Kathryn, she makes us get separate popcorn buckets because I eat so much, so fast, and I just can't stop myself until I hit the end, but I won't eat her share if it's in a separate bucket.

Okay. Berbye.

Transcribed by Rosie Thomas, Wolverhampton, UK, that lady whose face always seems really angry but inside she is happy thinking about sharks, dinosaurs, and snail m [ding].*

Some links which you may find helpful:

Please. My rabbit. He's very sick.

Dr. Jann Vendetti on the NHM Curiosity Show

ATTENBOROUGH TALKS SLUG LOVE

Fascinating fascinators

What is a semi-slug

Snails: the OG Cupid

Protein coiling: why shells are spirally

Hyaluronic acid moisturizers

Liquid crystal situations

Death By Beer: slug edition

Don't eat raw slugs tho k?

Hermit crab butts

Pals not GALS

For comments and enquiries on this or other transcripts, please contact OlogiteEmily@gmail.com