

# Potterology Part 2 with Dr. Rebecca Lai

## Ologies Podcast

### September 17, 2019

Oh heeey, it's still your neighbor who's always out vacuuming his car and you're like, "Is he really clean or is he so dirty that he needs to be vacuuming that much?" Alie Ward, back with part two of the Potterology episode of *Ologies*. Okay, if you have not listened to part one, go do that first. So much context and back story. There's wizard puns, so go there first. This is like the dessert portion involving your questions. But first, go fill up on the main course. So go on, git.

Alright, okay! Thank you so much to all the Patrons who support the show and send in questions and the folks who subscribe, and rate, and who also review because you know that I creepily read them. Such as, for example, Funky Fact Friday who said this week:

*I'm not a huge podcast person, and the podcasts I've listened to tend to come and go but not Ologies. It has kept my attention for over a year, plus now I have fun facts to spew at friend and family gatherings. Alie always asks the right questions and makes quality dad jokes. In conclusion, I want Alie Ward to be my dad.*

Good news, Funky Fact Friday, I am your dad. If you've been listening for a while and you wondered "Why does this lady call herself my dad?" It's because I make dad jokes, and just because I darn love ya kiddos. Also, I do wear socks with sandals sometimes. I did just yesterday, and I don't care how that makes you feel. Well, I do, but I hope that you're secretly okay with it.

Alright, so buckle up. Part 2 of Potterology, in which we ask all of your questions, and we talk about poisons, and antidotes, and anecdotes, and noble gases, and jerky wizards, dark arts, stun guns, risky business, fireworks, stomach butterflies, and more, with University of Nebraska at Lincoln chemistry professor and electrochemist, and Potterologist, Dr. Rebecca Lai.

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**Alie Ward:** Can I ask you some questions from listeners?

**Dr. Rebecca Lai:** Yes!

**Alie:** 113 questions. We're not going to go through all of them.

**Rebecca:** Oh my gosh!

**Alie:** Sarah Nichelle wants to know: Are you a real wizard? Be honest. [*Professor Umbridge: "Have you brought the Veritaserum?"*]

**Rebecca:** That... I'm not prepared.

**Alie:** You can say no comment. [*laughs*]

**Rebecca:** I don't know!

**Aside:** Rebecca pointed to a nearby tea-stained, sepia-colored letter in a shadow box frame. It looked like something, say, like an owl might drop down your chimney.

**Rebecca:** Okay, I can tell you one thing! If you look at that letter right there, presumably I received that when I was 11, but then I was not 11 when JK Rowling had those books out. So, I don't think I received it.

**Alie:** You're not a muggle. You are *not* a muggle. You're a wizard!

**Rebecca:** People have asked that before. I think my brand of magic is really weird. I don't think there is that kind in *Harry Potter*. I think my brand of magic, I look at it because I like learning and I like to absorb other people's knowledge and what they learn. So, I guess my magic is absorbing other people's magic. People are developing all their great things and, you know, what I call magic every day. And from whether it is listening to *Ologies*, or watching YouTube, or just, you know, reading encyclopedias. I do like that. So any of those, I'm absorbing other people's magic, magic that has been developed years and years back in the day. So that's how I look at it; my magic is to absorb other's magic.

**Alie:** Sydney Brown wants to know: What's your favorite spell?

**Rebecca:** Favorite spell? *Expecto Patronum*. [*Harry Potter*: "Expecto patronum."]

I think that is probably not just mine, I think it's probably the top one... Well, because it repels Dementors based on what JK Rowling... How she came up with that was it was related to when she herself suffered from depression. It's basically something that, if it's making you feel sad and unhappy and despair, and you have this *Expecto Patronum* that will be an animal. Mine's actually, according to Pottermore, a beagle! A little dog! That's my Patronus. So, I think the Patronus charm is a really great spell. Because sometimes... We're humans. We do get sad and despair or sometimes sad or sometimes disappointed. You know having that to protect us is a great thing.

**Aside:** Quick aside. Is the comfort of a Patronus animal magic? Is it witchcraft? No, fam! It's just a big frothy stew of biology and chemistry. [*squishy splat*] According to "Psychosocial and Psychophysiological Effects of Human-Animal Interactions, The Possible Role of Oxytocin," this is a meta-analysis of a bunch of studies looking at HAI - human-animal interaction, aka snorgles, aka *snugs*. So, HAI has been investigated for its effects on hormonal indicators of stress, things like cortisol, and on neurotransmitters like epinephrine.

One Australian study found that dog and cat owners had fewer sleeping problems and went to the doctor less frequently than non-pet owners. And in a Chinese survey, researchers reported that dog owners had higher self-reported fitness and health, they exercised more frequently, they slept better, they saw their doctors less frequently and took fewer days off from work than comparable non-dog owners.

There was another study in the same meta-analysis that involved showing participants a live tarantula spider [*"Okay..."*] saying they'd have to hold it later on [*"AAHH!"*] Now in the interim, they had the subjects either pet a live rabbit, a live turtle, a toy rabbit, a toy turtle, or they just had 'em chill out, without a toy or a live animal. And petting a live animal was the only option that reduced fear and anxiety. The tarantula is like, "Hi. Hi... I am a live animal. You don't want to pet me? Because look at my hairy butt. Look at it. Isn't it round? Isn't it cute? What's the matter?"

Now, the study also said that just loafing with a critter, especially doggos, can trigger oxytocin release in both humans and dogs, which decreases stress hormones and lowers blood pressure. So thanks, pups! Me rubbing your belly helps you soothe my soul.

Also side note, every once in a while I will get a really lovely, sweet listener who says that, like, squid or toads are their spirit animals. And I'm sure y'all are very compassionate and kind, I just wanted to let you know that saying 'spirit animal' is something reserved for Native and Indigenous populations. So, if you would not wear a

headdress to Coachella because you know it's really not your place, you might wanna nix 'spirit animal'. Just burn that right outta your brain.

Alternatives? Why, yes! Of course there are many, I'm glad you asked. You can say: alter ego, familiar, or you can say Patronus! So your Patronus might be a toad or a squid. And some gracious furry folks have said that 'fursona' is also fine with them.

Moving into a different shape entirely, some listeners asked about the transfiguration realm. These listeners were: Samantha Panepinto, Claire Meyer, Hannah Reilly, Daniella Buchanan, and first-time question-asker...

**Alie:** Ashra Kolhatkar says: On a scale of 1 to 100, just how cruel is transfiguration when it comes to animals? What happens when they mess up a switch and now your beetle is half button and half beetle? Any idea? That's a tough one.

**Rebecca:** I think in terms of that it's because the transfiguration... The fact is that I do believe that it's cruel in a way... I would say it's about 70%. But the fact is that I do believe, and it might not be mentioned here, I think that they probably could reverse it. I think there's some advanced... maybe not everyone can do that, just don't count on Neville Longbottom to do that at that time when he was... Now he's much improved. But I'm sure maybe Professor McGonagall can do that. I think it could be reversed.

**Alie:** Lauren Wheat and Michelle Grondine both want to know: Have you seen improvements in scores since introducing *Harry Potter* into your teaching, and also, what is your Hogwarts house?

**Rebecca:** I'm Ravenclaw, first of all. I will answer that easily. Matches my nails.

**Aside:** Rebecca did have a fresh, tapered manicure in a lovely periwinkle hue. And, ever the scientist, she said it's tough to isolate the data to track down how much better students did in chemistry after taking her Muggle Magic course because they're typically enrolled in other chemistry classes with other professors. But all in all, she hopes it helps students become passionate about chemistry. Myself, I'm going to go out on a limb and say it's gotta help.

Now a few folks posed linguistic queries including Jack, Benjamin Harrison, Wayne Brantley, Rebecca Zaunbrecher, and...

**Alie:** Destiny Rector wants to know: I know a lot of spells and their names are based in Latin. Are there any based in other languages that are maybe a little less common? Have you ever found that?

**Rebecca:** No, I have not done too too much on that. Most of them are Latin based, but I think there might be others as well, I cannot say. But that's what I'm hoping and imploring that another professor will continue this - A Muggles Guide to Harry Potter's Linguistics. Because honestly right now, I look at it and it doesn't have to be in Nebraska, it could be global, right? Because people did ask me if I could have this class broadcast live online. It could be done, of course there's some... because it's paid, and the credits, and stuff like that it cannot just be for fun. But I don't mind if it could be.

**Aside:** Okay side note, any Georgetown folks out there? Scan your course catalog for a class called Knights of Old and Harry Potter, which explores the medievalism of JK Rowling's *Harry Potter* novels by diving into "medieval antecedents from the 12th and 15th-century in French, English, and Latin literature as well as selected volumes of JK

Rowling's *Harry Potter* novels." So, spooky muggles: Your people, they are out there, they are teaching classes.

**Alie:** Aoife Casey asks: What Harry Potter subject is the most like chemistry in your opinion? Mainly between Potions and Transfiguration.

**Rebecca:** Potions. Definitely Potions, because Potions... and some of them, we didn't even get to that, actually. Some of them, what I did in the class is I actually look at a few recipes such as the Draught of Peace and also the Wit-Sharpener Potion. I actually look at the ingredients, what JK Rowling listed and I look at the chemistry of them and try to prove whether JK Rowling is right or wrong to put, you know, valerian root in the Draught of Peace, or putting ginger in the Wit-Sharpener Potion. So, I think there's some correlation. I think she knows her stuff. So, Potions for sure.

**Aside:** If you've ever taken valerian root to calm anxiety or to help you drift off into a deeeep, deep sleep with wacky dreams, there is an acid in it that's similar to the neurotransmitter gamma-Aminobutyric acid, nickname GABA - "Just call me GABA for short, - which handles calming the nerves. And the jury's still out in the scientific community on its efficacy, but some trials show that it works better than placebo at helping you chill out and calm down.

Now, another fun fact: valerian root smells terrible, soooo bad, so awful. So if you try it, just push through that fermenting dung, rancid sock flavor, and then it's all good. If you're not left traumatized. I mean, accursed is the stench, but just dreamy its effect. Trust me. I am in no way a doctor though, so ask one first.

**Alie:** Emily Reed wants to know: What's the most obscure and/or seemingly useless spell?

**Rebecca:** Hmm, I think the killing curse. Sorry, I don't want to say it. [*Voldemort: "Avada Kedavra!"*] Because I don't think we need such things.

**Alie:** Okay! That's a good answer. And Jam Cruz wants to know: What potions might actually be medically useful for us muggles?

**Rebecca:** Well I think a wit-sharpening potion, containing ginger as one of the ingredients is not bad. People study ginger a lot, and it has been used in India and China for many, many years for indigestion and digestive system issues. And correlated to Wit-Sharpener, it's that... Well, it may not make you sharper, but yet if you don't have a stomach ache you'll feel a lot better right? I mean, if both of us right now were having digestion problems, I don't think we'd be sitting so comfortable talking right now. [*"I really gotta go."*] We might want to be other places.

So, I think it might just have some correlations in that. I think ginger overall, people have studied it for a lot of different... to see if they could find chemicals and components in that that might be able to help with other diseases and other maladies beyond digestive system issues.

**Aside:** So yes, ginger. Scientists are looking at it for its pain management, and anti-inflammatory properties. And, of course, there is a reason they serve it on airplanes. It's kind of like a magic potion, it makes you less nauseous. How does it do this? Well, I looked into it. It breaks up gas and it moves things through your system. So, thanks ginger! You're a real fart buster. Also, I think people drink it on airplanes because if you have to walk through first class and see people drinking champagne, when you get to

your seat you want something gold and bubbly, but also free. I have yet to pursue this theory academically, but I have a lot of faith in it.

Speaking of a classroom, this next question was seconded by Elle McCall.

**Alie:** A couple people asked and Emma Jane Julien wants to know: Why is it *LeviOsa*, and not *LeviosA*? Like, what if someone has an accent, like if they're German wizards instead of English wizards? [*Hermione: "It's leviOsa, not leviosA."*]

**Rebecca:** Well, I think in that scenario, clearly both Ron and Hermione... to my best knowledge I think they are British. I don't know why Ron said it that way, Ron just has a different way of... Maybe different parts of the UK have different accents, absolutely! It may be that. I have never heard of this question. This is lovely. I would just recommend she try her best to say it the right way because spells, you don't want to get it wrong. Even though levitating this thing or not is not a big deal, but it could be. If it's a wrong curse, you might just get into more trouble than what Ron got and just poke a person's eye out or something and beyond.

**Alie:** And you have kind of a beautiful, almost like a British lilt to your voice too.

**Rebecca:** I'm originally from Hong Kong so I learned British English.

**Alie:** Oh my gosh! I was wondering because you've been in LA. You have such a beautiful voice.

**Aside:** Seriously how golden, and sparkly, and wonderful is her voice? So much. Now, Margaret Hammersley had this next question, which, spoiler alert, gets us back to something from episode one that rhymes with schminvisible schminks.

**Alie:** What is the best lab demo to get people interested in chemistry and science because it looks like magic?

**Rebecca:** *Aparecium!* Right now, let's see! Do it again!

**Alie:** [*laughing*] Invisible ink!

**Rebecca:** [*writing*] Alie Ward is awesome. Okay, that remains a factual thing ok.

**Alie:** This is the best day ever! So that is invisible ink, you gotta say?

**Rebecca:** Absolutely!

**Alie:** Chris Brewer wants to know: What would be considered the Dark Arts of chemistry? and Michelle Grondine says: Second that question.

**Rebecca:** Dark arts, hmm... Well, there are some dangerous chemicals too. I have to say. But in general, in the chemistry lab, no matter what we work with we always consider them to be dangerous and so we will take extra precautions and care. So one thing about me being a professor, training my graduate students, or teaching the class later on, I always remind them safety is the most important because if you're not safe, you're doing dark arts! You know why? Because you could generate an explosion and kill your neighbor right there! Whether you want it to or not, that could occur. Or that you're gonna break the whole glass case of chemicals that would cost \$5,000 or \$10,000, so that's not good.

**Aside:** Solid advice, safety first. Unsafe behavior is Dark Arts. So texting while driving? Dark Arts. Those weird kids who do parkour off of skyscrapers? Dark Arts. Room temperature mayonnaise? Dark Arts. Safety first.

**Alie:** Katie Chavez wants to know: What type of elixir will help us live longer and healthier?

**Rebecca:** Well, Elixir of Life, Nicolas Flamel got to 600-something. If we have the Sorcerer's Stone, that would be pretty good. But we don't have that yet. I say drink some green tea. Still pretty good antioxidant content, some EGCG in there. It's all good. I've actually analyzed it myself.

**Alie:** You *are* a wizard!

**Aside:** If you're like "Hey, Pops, what's EGCG?" I'm about to spill that piping hot green tea. It's epigallocatechin gallate, which is a polyphenol compound that some studies show has potential to reduce inflammation and possibly prevent cancer. Needs a bunch more research.

Also, Rebecca at this point whispered something alluding to a process involving tea and gold. But I had to cut it because that chemistry might be proprietary. Don't worry Rebecca, I didn't fully grasp it and would not begin to know how to steal it.

Now, the next question was also asked by first-time question-asker Dawn Ewald, Carrie Weber, Sydney Brown, Crystal Mendoza, Annika Harrison, aaand...

**Alie:** Jessica Beard wants to know: If you could perform only one spell, what would it be?

**Rebecca:** One spell, woow. Sorry, that... [*Jeopardy theme song*]

**Alie:** That's a hard question.

**Rebecca:** It is! If it's just only one spell. Definitely not the killing curse! It would not be that. Those should not even exist. I suppose I'd try to go with *Expecto Patronum*. On a very sad day or maybe if I think that there are Dementors around, or other people around that I don't want [*laughing*] (just kidding), I might try to protect myself. Or if not *Expecto Patronum* I would go with, I suppose, *Protego*, because *Protego* you protect, basically. You protect from who-knows-what could happen. It could be an earthquake, it could be something falling. So if I could use one thing to protect, I think I would do that. Hopefully, I never need to use that.

**Alie:** Hopefully, you won't!

**Aside:** This next question was also asked by Aracely Contreras, Sonya Karp, Ace Lane, and chem grad student Jessica Beard.

**Alie:** And Jessica Beard also asked: What moment in your research felt most like magic?

**Rebecca:** Actually, most of the first Eureka moments... That's one thing that goes back to, when I think about research, that no matter how... You like your field, you really like what you're doing, think about it. The moment that you're doing that experiment, adding this and that, and see that color change for example. I do different kinds of research. But for example, if that is the case, for that one single second in the whole world you might be the only person who knew about that fact. And I think that's the eureka moment. And you can create it again and again as you do experiments and go in the lab.

No matter how minute... And people think, "Your discovery's not as significant," but at that moment, you're the only person at that moment to be able to see that. And that's one thing I really... to know the truth of that reaction, or the system, or whatnot, is amazing. I think that, to me... It's not just one, it could be many of that moment. But it's just that little eureka moment that you're like "wow," and then you think about it. That specific moment in the lab that you found, that's way before you're making these beautiful figures, publishing in a journal, and getting news articles written about it. Way before

that, just at that instant you're like "Wow, I'm the only one who knew about this at that moment." It's kind of really neat.

I wish I could go back to the lab and do more work. These days I cannot because I run the lab, and I teach, and do other things. But those are the moments that I think scientists will always cherish. Now I cherish it vicariously just like last night sending an email to Channing like, "Channing, how did the experiment go? Did it work?"

**Aside:** Channing is the one who told me about Rebecca. So, Channing, thanks for hooking it up. I owe you one high-five from each hand.

**Rebecca:** That's really, if you think about it, that moment is pretty unique no matter what other people think, like "Oh it's just minute. It's not like you found a cancer solution." But at that moment you're the only one in that world who knew this fact, this truth. After all, science is about truth finding right?

**Alie:** Yeah, what a special, surreal moment.

**Rebecca:** Yes absolutely! I don't want to exaggerate it or have people think it's overrated or whatnot, but I think at that moment when you planned so much into that experiment hoping to see that... Because experiments are not just, "Let's put some stuff together and I'm sure a reaction's gonna occur." The same goes for spells. I'm sure you have to put effort into generating these spells, and we really carefully plan it, and have lots of hypotheses in your own mind what will happen, and then you see one happen, "Wow. That is the truth, okay. Out of all the other options that is the answer." A lot of times you go into an experiment and you think it could work this way, it could also be this, this, this. What will happen? It's amazing, just the process of it.

**Aside:** Side note. I wondered what the etymology of 'eureka' was and "*Eureka*, I've found it" is from the Greek *heuriskein*, to find. So in case you need a new way to say "I can't 'heuriskein' my keys. What is wrong with my brain? Where are they, why, why, why? I'm late. *Eureka!* They're in the fridge!"

**Alie:** Sarah Terry wants to know: Are the sparks that come out of a wizard's wand noble gases? They wouldn't spark if they were noble, right? Or no?

**Rebecca:** You are right! Exactly! They are not. I mean I think, they're most likely, maybe, hydrogen. [*laughs*] No, noble gases like argon and neon, no. But could that be argon, neon... Well, you think about neon signs and all the others, there are some conditions it could be, right? If you think about krypton, neon, xenon, and xenon lamps and things like that. There are some conditions it could be, so therefore I think she's on to something. She should think about it.

But it could also just be fireworks, you know. Maybe one sparks off different colors because fireworks are all, depending on what chemicals are in there... If you have lots of sodium you're going to get yellow fireworks for sure. So, all the fireworks of different colors all depend on different elements.

**Aside:** Yep, celebratory sky explosions are all about chemistry! So the next time you're at a stadium, or at someone's very expensive yacht wedding, or hoping that your neighbors don't burn your city down on the Fourth of July, just think, "Hey! That red one is the metal salt strontium carbonate. Oh look! Blue! Copper chloride! Oh! Yellow! Hey, what's up sodium nitrate? I see you, and I see you."

Also, thanks to the sponsors of this show who make it possible for us to donate to a cause each week of the Ologist's choosing. Dr. Rebecca Lai chose PBS.org which is funded about 50% by individual contributions like this. And now, a few words about sponsors of the show who make that possible.

[Ad Break]

Okay, back to your Patreon questions. This next one comes from Ashra Kolhatkar.

**Alie:** What allows some spells to continue to have an effect after the spell-caster dies? Like Mad-Eye Moody's protective spells over Grimmauld Place after his death, while others stop working immediately after the spell-caster dies?

So, why do you think some spells continue to have an effect, versus others not? What do you think?

**Rebecca:** That's a very interesting question, but I think it depends on the strength of that spell too. I think there are some spells that will have that ability and some will not. I know I'm not really giving an answer here, or maybe not an answer that's what she would like to hear, or not a great answer, but I think that there are categories of spells as well, and there are definitely some spells that have to have a timeframe. Some of the spells will end on their own as well. To be honest, I do not think that a spell such as *Stupefy* will last forever.

**Aside:** Sidenote CliffsNotes: The *Stupefy* spell from the *Harry Potter* books stuns an opponent, and Rebecca works it into the Magic for Muggles course by teaching the science of stun guns.

Stun guns require contact with a foe but taser guns shoot out coily wired darts kinda like a chameleon tongue. The electroshock they administer can be up to 50,000 volts, which, in a stun gun, can cause enough pain to temporarily incapacitate someone. A taser, that can hijack the electricity system that neurons use to communicate and make muscles spasm and leave an opponent well, floored. Not dead, but *floored*. On the floor. ["*Let the bodies hit the floor.*"]

**Rebecca:** You see even the spell-caster is still alive. When you stupefy or you stun a person, the person will come back to life. You don't need to use *Rennervate* to revive the person. I think the person could come back as a function of time.

So, you see there are spells that actually have a limited number of hours that the effects could last. So therefore, there of course are ones that have a much longer lifetime and there are some that will end with the spell-caster being gone. So I think, depending on what type of spells, they're not forever.

If you think about if it's forever, like *Tergeo* or *Scourgify*, you just use it once and it's already clean and got dirty again, do I have to reuse it? Or I already did that spell two minutes ago and someone just threw some soil on this, whatever. So, it just depends on the specific spell and how the wizard who developed that spell wanted it to be. I think so.

**Alie:** I think that makes sense. Its intention.

**Aside:** Sarah Terry and Kirana Bergstrom both asked about finding antidotes to poisons. And apparently it's not as easy as just waving a stick at something.

**Alie:** That's a complex question.

**Rebecca:** It's a very complex question. No, actually the fact is that with chemistry and biology antidotes, it's really about understanding the ingested chemical, whether it is cyanide, or

some scopolamine, or mandragoramine, which is from mandrake. These are these alkaloids, compounds that are poisonous. You need to know what poison you ingested or you were forced to ingest. So, what you took, and understanding how that poison will interact with your body. So, you find an antidote against that.

And there are multiple poisonous compounds that could have the same effect. So maybe one antidote can go against them as long as you need to know the biological pathway of that compound, that specific molecule which is affecting which part of your body and which... you know, down to the very specific. Therefore, sometimes there are classes of antidotes that could go against a few different types of poisons.

**Alie:** Ooooooh!

**Aside:** So some antidotes work as an anticoagulant if the poison or venom is bunching up blood cells. Antivenom can be injected antibodies that have been collected from animals who have been exposed to the venom. And an EpiPen is a shot of epinephrine, which can counteract anaphylactic shock.

Also, fun fact: poisons are eaten, venom is injected. I feel like this was in a previous episode, but just in case you forgot. So, there are no poisonous spiders unless you eat them. And even then, your stomach will likely break down the poisons. In case anyone ever points to your spider friend and accuses it of being poisonous:

**Alie:** Rebecca Hall wants to know what's the weirdest *Harry Potter* potions ingredient that you're like, "Whoa, this could not be all a real thing, but it is a real thing."?

Any crazy potion ingredients? Any, like, "What is this?"

**Rebecca:** I need to find a unicorn's horn or something first. Right? Because unicorn is a component. There are definitely potions with unicorn components in them. I think that's a little bit hard to find. I want to find one first, really. And I want a real one. Not the ones that people presumed were unicorns. They're actually narwhals. They're taking that horn from narwhals.

**Alie:** Really?

**Rebecca:** And one should not be doing that either, just like people should not be taking ivory from elephants. I don't think people should be just taking that from the narwhals either.

So, if they could find a real unicorn, I would be interested in that.

**Alie:** Maybe we'll find a fossil one!

**Rebecca:** Across a rainbow somewhere.

**Aside:** PS: Narwhals are called the 'unicorns of the sea' and their tusks are just one big, long tooth that's grown through their lip, and they use it to communicate with each other about the water they've been in, just what's going on in their life, who got divorced. And the name 'narwhal' derives from old Norse for corpse because their blotchy grey skin looked like a floating dead sailor. So, always just embrace those mutations, you magical unicorns! Also, all those in favor of a future narwhal episode say, "Corpse Tusk." Alright, duly noted, will do.

**Rebecca:** There are other things such as Amortentia. I know people like that one because that's the love potion, but you need to get some Ashwinder eggs. I don't think I can find that. It's a little serpent, it's a magical serpent. I cannot find that.

But you see within the love potions four common ingredients: rose, thorns, peppermint, and powdered moonstone. Actually, I have some moonstone in my drawer. I show my students moonstone as well. But find the Unicorn for me. I might just ask them to do something for me, some magic.

**Aside:** This next question was asked by Jen Athanas and Yoonji Kwon and it's *verrry* romantic. [*romantic saxophone*]

**Alie:** Another listener wanted to know: Is there anything in life that's really close to love potion, other than just, like, margaritas or something?

**Rebecca:** Love potions, yes. I think if you look at it as more talked about in the animal world in that case. Because you can think about pheromones, right? Pheromones really attracting... you know. You think about the queen bee, which secretes different types of compounds. Pheromones are just compounds, right? Molecules.

And you can also think about even the moth. If you think about the silkworm moth, basically *Bombyx mori*. They are little, they cannot fly anymore. You think about how they cannot fly; they just move around. How can they find to reproduce, right?

**Alie:** Yes, how do they do that?

**Rebecca:** Via pheromones, the sense of it, they could just sense, "Oh, the right moth is right there. Okay."

**Aside:** *Oheyyyyy!*

**Rebecca:** Basically you can use that. Pheromones are important. I think if one could concentrate that and make some extract, maybe that could be used. [*"60% of the time, it works every time."*]

**Rebecca:** Other than that, forget Amortentia or using a love potion. Why don't you just make beautifying potions cause they're for the others too! Well, you know, I mean that's also not a bad thing. I think, you know...

**Alie:** Make everyone a little hotter.

**Rebecca:** Exactly! That'd never go amiss. A little bit of beautification is a good thing. Okay. So, yeah, you have that one as well.

**Alie:** That's your fashion background coming in too. Get a little bit of style!

**Rebecca:** Gotta do that, you know, it's just part of life.

**Aside:** For more on the science of grooming, you can see the Cosmetology episode, and for more on the psychology of beautification, see the two-part Kalology episode, which debunks the need to pluck every hair from your body and/or hate yourself into looking perfect for others.

Speaking of myth-busting...

**Alie:** Any flimflam that you would want to debunk about chemistry? Any myths about chemistry that you want people to get over?

**Rebecca:** I think first to think that chemistry is really hard or maybe you cannot do it. No. I think if you like it enough... It's a lot to do with the passion, you need to like it. If you like it enough, you'll be able to do it. I think that's one thing.

Another thing is that “Chemistry is only useful in this and that,” but actually everything that you use, from the food science I cover so much, it involves chemistry. You can do a lot of things with a chemistry degree. There are a lot of, you know, career options. We talked about perfume, right? People will not necessarily associate it with chemistry, but actually my friend Dr. Cheung and myself, last semester we actually taught a skincare chemistry class. It’s also a one-credit honors course. We talked about antioxidants, talked about sunscreen. We talked about a lot of things they do.

A lot of chemists are involved in formulation and making sure that the product is good and feels smooth. It’s about the efficacy, the fact that it should work and work well, but it’s also about that it should feel nice on your skin. So that’s actually a lot of science involved in just making one cosmetic product.

So, I think one could think about chemistry in many different ways. And I’m just using this example of perfumes and cosmetic chemistry. If you’re interested in food science or food chemistry, right? We are like most people, okay? I like food and I talk about it a lot. It’s because I do, so just speaking from my own perspective that there’s just lots to study. Right?

If you are a botanist, you’d like to be like Neville Longbottom, to be herbologists. Right? I mean you study it. We just talked about yew trees, you talked about Taxol, we talked about holly trees, we talked about people who could do that type of study. If you’re a naturalist, you like to find out about nature, understand nature. You can study trees and look at what kind of compounds and chemicals you can get from trees and, “Will these compounds be able to help to improve human life?” I think at the end doing chemistry, doing science, I think in my humble opinion, is you really improve human life and I think there are many ways of doing it.

You know, making perfume makes people smell nicer. It’s good. You know, beautification is good, but it’s also very important, very good to do biomedical research and understanding the effects of these compounds on cancer cells and different types of cancer cells.

These are just a few examples of what one could do if one has an undergraduate degree in chemistry. Of course, if you want to go into specialization, to go into graduate school, you can choose different topics as long as, again, it’s about passion, right?

If you look at ultimately why JK Rowling can create a world like that, it’s because she’s passionate about it. Without passion, she cannot. I mean, I’m sorry, very few people will be able to do that, to sustain a career at that level. So, therefore, you have to wake up and want to do it, I think.

**Aside:** Aaaaah, how inspiring! Having stomach flutters for your job. PS: even that is chemical. I just googled it and apparently having *peptic Lepidoptera* – butterflies in the stomach – is because when we’re excited, we think we’re going to have to fight someone so our blood gets rerouted to our muscles, even if we’re just happy. And the butterflies are because of lack of blood flow to your food-sack. Mention *that* on your next first date if you need an icebreaker and instantly weed out decent people who are not into those disgusting fun facts.

**Alie:** And the last questions I always ask everyone. What is the suckiest thing about your job? What is the hardest thing about your job or about chemistry? What is something that you’re like, “Grrr! Even though I love you, chemistry,” this gets your goat.

**Rebecca:** I wouldn't say in terms of chemistry, I would say the toughest job about being a professor in an R1 school or like a PhD-level school, it's still ultimately, is the amount of work. You have to work a lot.

The fact is it's really tough to be good at everything. The trilogy of academia is research, then teaching, then education and outreach. And each of them will require a lot of time if you want to do good at it, right? If you want to do a great job.

Research involves doing... I do biosensor research and I have graduate students I have to train. I have to obtain funding. You have to do a lot of the writing and all the others. So it's a lot of work. And then teaching, you know, is also very important because I look at teaching and mentoring ultimately is what I really like about this job the most, I know you asked me what I disliked, but I would like to, you know, buy one, get one free. I'll give you what I like the most is...

**Alie:** That's the next question!

**Rebecca:** Exactly! Oh, sorry. Preview. I should stop. Okay. See, I thought you asked what I like first! Usually it's like, "Do you want the bad news first or the good news?"

**Alie:** No, I always end on... I always make you say the worst thing and then I end on a high note.

**Rebecca:** Okay. So, the hard part is really about the amount of time that, in order to be very good at research, very good at teaching, and very good at education and outreach, you have to put a lot of time in there. And I'm trying my best, you know, I do research, and I teach, and I also am currently the Nebraska MRSEC Education/Outreach Director and Jocelyn is Assistant Director. That's why we are partners in crime.

**Alie:** Hi Jocelyn!

**Rebecca:** And so, to do that, I really enjoy it. But of course every part of the work, in order to do a great job, it's a lot of time involved and you have to prioritize things. So, I think the tough part is that it's hard work.

**Alie:** So, a lot of hours.

**Rebecca:** A lot of hours, exactly. I think it's hard work. I would say most people in academia would agree it's a lot of hard work. But if you like it, that gets to your next part. Right?

**Alie:** Yeah. Yeah. What do you love the most about what you do? And I can't even... I don't even know how you're gonna answer this because what you do is so awesome! So cool!

**Rebecca:** I like too many things. I think probably people would think that about me. Yes, I do like a lot of things, but ultimately I think what I like the most is really about teaching and mentoring students.

Those two are actually together in some sense. Right? You know, you think about my research group with my graduate students, my undergraduate students, or visiting professors in my research group doing research and how I teach them, mentor them, provide them with opportunities to do different things for them to advance in their career in the future.

So I really enjoy that part of it, but also my classes. You know, the class I'm going to in half an hour. And because it's also very satisfying to see the students before starting your class versus after, you know how much they learned. Just seeing them learning, I think,

that is a very rewarding part. And you can see that from, even within one semester of teaching them. Or like with Channing, the student we just talked about, it's already close to five years I've been with her.

And so you can see that it's actually both are equally important and, to me it's very satisfying. And also even for the students that I teach, in the class only, maybe with them for one semester or whether it's a class I'm teaching or the *Harry Potter* class, if later on I could see their future, and some of them I still keep in contact, and then I could see them doing great things in life. It's amazing, you know, it's just... I'm not trying to say that I had, you know, that much impact on them. Maybe even if it's just a small little part, I think it's still a very good thing.

And I would like to continue to do that, to be a good teacher, to be a good mentor. And I think it's an important thing because I think being a good teacher, a good mentor, and being able to communicate well, it's not only for this profession. It is probably very important for many different professions.

**Alie:** Whether you're an author, or a fashion designer, or a chemist, or a teacher...

**Rebecca:** No, absolutely. Absolutely. I think so. Even if I wasn't a professor, if I worked in the industry or another place, you still have to teach people, right? You still want to mentor people because at some point you go higher, you're going to have new people that are hired into your company. How do you guide them? How do you help them so that they will continue to do great things? So, I think that it's a skill set that... It would be nice if we all have that.

**Aside:** Okay, I had to ask one more question:

**Alie:** And if you could tell JK Rowling anything, what would you tell her? If you could send her a message?

**Rebecca:** Ah, this, I thought about. Um, um, ah, there's so many things! I suppose I'll just say that JK Rowling, you're awesome!

**Alie:** In invisible ink!

**Rebecca:** Exactly. I think that I will physically show her that she will have her own JK Rowling diary, not just Tom Riddle's diary. It will not be stabbed by the Basilisk tooth. It will be fine. It's not a Horcrux. [*Harry Potter: "With a basilisk fang!"*]

Um, so, um, I would say thank you. Actually, I really would say, I think, thank you. Because of what she has done was so inspiring for me to be able to develop this class, and usually when I gave my talk, I always end with thanking her for giving me all this inspiration. So to me, I think, two words, just: thank you. I think it's great.

I mean, of course I would like to meet her and hope that there are other things, but if it's just a very short meeting, I would just like to thank her for what she has done and continues to do inspiring me and so many other people. For her to have done... you know, I'm sure she's also gone through a hardship and all the others, but to be able to persevere, I think that's very, very powerful and I think a lot of us could always learn from that.

**Alie:** Thank you so much for doing this. I think you just made a bunch of people who didn't realize they were chemists into chemists. You may have just birthed some new chemistry aficionados!

**Rebecca:** Why not? Exactly. You can do all sorts of things with it. And just being an experimentalist going into a lab thinking about, “Ooh, this is what I think would happen. Let’s see. Hmm. If I do this together would I be able to get this reaction?” It’s an amazing feeling when you get it right and it worked in a way that you expected, it’s very good.

But remember, you learn a lot when you did not get it right either. I told my students there are just no bad results. If your experiments were not well planned, then that’s bad, you go into a lab without knowing what you’re supposed to do. But if you have planned it and the results were not as what you expected, then you want to learn from it.

You see, well, what could, what could this be? Did I do something wrong? Or is that really how this reaction goes? If it is really how this reaction goes, well, I may never get to the next step, so how am I going to start to circumvent that? What am I going to do to solve this problem?

People say that chemists, they make solutions: literally a solution, like that coffee is a solution. No, we make solutions! We find solutions! Those solutions that may not be able to be, you know, placed inside a cup.

So I really do see that. I think that if people have that type of mindset, you know, curiosity. Always driven by curiosity. Curiosity, creativity, hard work, perseverance. If you have all those... throw in good number five: time management, because we all have a finite amount of 24 hours. If you have a Time-Turner, you might have 25. But other than that you get that amount of time. How are you going to utilize it? I think with these combinations, I think lots of people will become fantastic scientists, not just chemists, just a wide range.

I mean chemistry is great but, if they are interested in pursuing other fields of science, I think it’s also amazing, right? With the ultimate goal of trying to improve human life and improve this world.

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So: curiosity, creativity, hard work, perseverance. And if you can, throw in number five: time management. So, keep asking smart people goofy, stupid, and poignant questions, because that’s how they learned everything they know. And we’re all going to die anyway. Might as well ask questions.

For more on University of Nebraska Lincoln’s Chem department, you can follow them on [Twitter](#) and [Instagram](#) @UNLchemistry. *Ologies* is also on [both](#) platforms [@Ologies](#), and [I’m on there](#) too [@AlieWard](#). *Ologies* Merch is at [OlogiesMerch.com](#), and we now have stickers. We have shirts that say “*heeyyyyy*” on the front and “*burbye*” on the back. There are hats, totes, and back-to-school merch. It’s all on there.

Thank you, Shannon Feltus and Boni Dutch. They host the comedy podcast *You Are That*, which is amazing. They help manage all my merch too. Thank you to Hannah Lipow and Erin Talbert for adminning the *Ologies* Podcast Facebook group, full of nice people. Thank you to assistant editor and domestic cheerleader Jarrett Sleeper who hosts the mental health podcast *My Good Bad Brain* for assistant editing.

And thank you to everyone’s mustachioed Patronus, Steven Ray Morris, host of the podcast *See Jurassic Right* about dinos and *The Purrrcast* about cats, for helping stitch this all together each week. If you like dinos and Steven Ray Morris, side note, he will be live this weekend, September

21st and 22nd [2019] at the LA Natural History Museum's Dino Fest, so do go see him there live. Give him a T-Rex high five. Nick Thorburn wrote and performed the theme song.

And if you stick around until the end of the episode, you know I tell a secret and this week's is that I recently bought a bunch of washcloths and started using a fresh one in the shower each day and... I get it. I get it! What a luxury! What an exfoliant! It feels like a spa day every day. What a gross thought, all of the dead powdery skin I've been carting around for years. Wow. So, washcloths, where have you been all my life? Thank you for coming into my linen closet and my shower with me. You are appreciated.

We'll be back next week with Phenology, which is the study of seasonal change. We're going to talk a lot about fall leaves. Woo! Birds migrating! That is a precious episode and I cannot wait for you to hear it. And then the week after that starts Spooktober! I'll be in Austin this week doing a few interviews there that will be airing in Spooktober. I can't... AH! AaAaAhHh!

All right. Berbye.

*Transcribed by*

*Kori M.*

*Jude Kenny*

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