

Chronobiology with Katherine Hatcher

Ologies Podcast

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Oh hey, it's your invisible aligners you don't wear anywhere near 22 hours a day, and they know it, and you know it, Alie Ward, back with another episode of *Ologies*. I'm alive, y'all! I slept so many hours over the last couple of weeks dealing with this flu... Whooo!

When are you listening to this? Are you turning the coffee pot on and feeding the dog? Are you on the 7am train to work? Is it your lunch break and you have half a burrito spinning slowly in a microwave? Maybe the sun is setting while you walk to your car. Are you nursing a human who has decided to snack on your boobage at 4am? At least once a day it seems we look at a clock and we're cranky about it. Myself, very much so, all the time. So, we are here to talk about why.

But first, we're going to talk about you, saying thank you so much for supporting via Patreon.com/Ologies, for sending in your questions that way, for wearing *Ologies* shirts and hats from OlogiesMerch.com – we have some great new designs up by the by – and for telling friends, and maybe foes, and in-laws about *Ologies*, and keeping it up in the charts by rating it and subscribing on all of your devices. And of course for leaving a review; you know I'm gonna lurk them, just like a gentle, happy, creep so I can read one back to you. Such as, this week's Megan Wint left a review and said:

I am in bed with my What is Real book and my binoculars to look out at the moon, all because of this podcast. Just when I thought I couldn't develop hobbies outside of my career, this podcast came along and made me love science again. I attend 'star' parties, bake bread, got my flu shot for the first time because of this podcast. Everyone should give it a try, even if you hate podcasts like I did, because everyone should question, examine, and value our little blips of existence in the world more often. Thanks for helping my serotonin receptors, DadWard.

Megan Wint, thanks for getting a flu shot. As someone who was just in bed for a week with it, I should have gotten one also. Ychk!

Also, shout out to RV Cat Daddy, who's going through a rough time in a tiny house with a few felines. May your next birthday not involve a divorce. I tell ya, I read all of 'em, folks!

Anyway, chronobiology comes from – you guessed it – our Greek friends; always putting things in our word holes! So, *chronos* means time, and *biology* means the study of life. So, it's a very real branch of science dedicated to understanding how temporal rhythms affect life, and that can be things such as daily, or weekly, or seasonal, or annual rhythms. And circadian rhythms, lets break that down, *circa* means around, and *dia*, a day. So those are the kind that a lot of us might be most bent about because those are the daily rhythms, so we're going to get into it.

This ologist, I know from Twitter. She hosts the podcast *Endocrine Disruptors*, which dives into things like your adrenal glands, and your ovaries, and your nards, and how your hormones get jacked. She got her bachelor's degree in biology at the University of Tennessee, focusing on bio-chem, and her master's at Northwestern's neurobiology program with the focus – are you ready for this? – “Sex Differences and Circadian Influence on Alcoholic-Induced Gut Leakiness and Implications for Alcoholic Liver Disease.” She loves this stuff.

So right now, she's in the middle of her PhD at the University of Illinois at Urbana-Champaign, and she says her first research love is circadian biology, but she's also fascinated by how hormones affect and are affected by daily patterns. So, we get *into* it.

I wasn't able to make it to Illinois to record this, but I was thirsty as hell for this topic. Quite frankly, I needed to be scared straight when it came to my shitty sleep patterns. They're so shitty; they're so bad.

She graciously crammed herself into the world's tiniest sound booth in Illinois on a hot July day and we chatted over video screen about what happens in our brain when we sleep and when we don't sleep. We talk about jetlag, and alarm clocks, and how rest affects your gonads, and chronotypes, and giraffes, and eye masks, and early birds, and night owls, and Botox, and light pollution. So go tuck yourself in and let's wade together into the comfortable darkness with Chronobiologist Katherine Hatcher.

Alie Ward: Hi, you're here! We've put you in a tiny booth across the country.

Katherine Hatcher: Yeah, and it's Midwest summer, which means it's hot as balls outside.

Alie: I'm so sorry!

Katherine: [*laughs*] It's all right. It builds character.

Alie: Yeah. Brains. [*sings*] Brains, brains, brains! And so, you are a neuroscience student, correct?

Katherine: Yes.

Alie: You're getting your PhD in neuroscience?

Katherine: Yes, I am.

Alie: Oh my god! How did that happen?

Katherine: Oh jeez. So, I was one of those kids in college who thought I wanted to go to medical school, and I joined this lab that they were studying the impacts of different compounds on circadian rhythms and looking at very basic science questions. So, I joined this lab; I just wanted to do it to boost my résumé. I got about halfway through that semester and I was like, "Screw medical school! I don't like people!" [*Alie laughs*] And I realized how much I really enjoyed scientific research. Well, the world did not agree with me. I didn't get into graduate school when I first applied. [*Shoot!*]

Alie: Oh, no!

Katherine: I think I applied to, like, six schools, and nobody accepted me. And that happens, so I went and taught high school for a couple of years, and then decided to go back to school to get my master's. I did a masters in neurobiology and during that time I applied to PhD programs again and got in to two of the four I applied. And one of them was one that I had applied to originally and I was like, [*with angst*] "You guys didn't accept me the first time! I'm the same person!" [*Alie laughs*] But I knew that I wanted... this was actually my top program, so I'm at the University of Illinois down in Urbana-Champaign, which is basically just a bunch of corn fields and soybean fields.

Aside: Katherine's worked on various neurobiology projects while there, but her PhD dissertation, by the by, is studying this class of compounds found in plastics, and polyvinyl chlorides, and in makeup, and fragrances, to see how exposure to them affects sleep quality and depression in women who are starting to go through 'the menopause', or like myself whose ovaries quit early, randomly.

So, these compounds are called, phthalates. Phthalates appear to be just potentially terrible for your body and your endocrine system. But they are awesome for a game of *Scrabble* when you just have so many Hs.

Alie: Going back, you couldn't have always been interested in neuroscience as a tot, because you can't poke brains as a wee one. When did you get interested in science?

Katherine: I'll be 100% honest, I was the worst... one of the worst people for this story because I hated science for a very long time. [*laughs*]

Alie: [*gasps!*] No, this is good!

Katherine: Yeah, I guess it's interesting. I've always been fascinated by animals and have always loved animals. I should've realized... I think my sophomore year of high school, at my school district we took biology. So, I remember taking biology and doing dissections and stuff and we got to dissect fetal pigs. [*Alie ughs*] This is gross, but whatever.

So, it was myself and two other people in a group dissecting this fetal pig, and then the teacher was like, "If you get the brain out in good quality, then you get bonus points." So, there I am, like, "Challenge accepted!" The two guys that were in my group were like, "Nope, not touching that." And I was like, "Fine, it's gonna be me." So, then it was me doing it. But then, I thought at the time... By the way, I did get the brain out, and it was beautiful, and my teacher was impressed.

Alie: How did you do it? Did you have to crack it like a coconut?

Katherine: Yes. There's like an art to cracking skulls. [*both burst with laughter*]

Aside: Are you ready for Katherine Hatcher? Get ready for Katherine Hatcher.

Alie: So, you got this pig brain out.

Katherine: Yes, I got this pig brain out. That's, like, my first remembrance of anything related to brain that fascinated me. But it was more from a curiosity/mechanical standpoint. But I was also one of those kids that was super fascinated by weird medical mysteries and stuff.

So, I had this interest in medicine and physiology and this curiosity about it, but I didn't think that science was anything beyond medicine. Like, I didn't understand what science was. My parents... my dad's a lawyer and my mom's an art teacher, they have no idea about anything about science.

Aside: So Katherine loved writing and being creative, but took an undergrad class in how muscles work, and thought "This shit's cool, I'll just go to medical school," which turned into, "Hmm, I'll study biochemistry," which turned into, "Wait, I love psychology and human behavior too, so maybe neuroscience is, like, all of that."

Katherine: I thought the questions were fascinating. I have some people in my family who have alcohol addiction, and so this concept of 'How does alcohol effect the brain?' has been something that's been really interesting to me, just from a more personal standpoint. So, I was kind of trying to slowly pursue those questions and there was this realization that, "Oh, science can be a career? You don't just have to be a medical doctor, or a veterinarian, or a pharmacist or something to be in science?" You can do so many other things.

Aside: So time, as always, is ticking, so let's get to the nitty-gritty of chronobiology.

Alie: What is a circadian rhythm? How do you describe that to someone?

Katherine: So, my favorite way to describe circadian rhythms is that they are behaviors or biological processes that exhibit some sort of 24-hour pattern, which means we see the same approximate peak and trough in that pattern every single day. So, some examples of what these would be, I think the most common people think of is sleep and wake activity because that's, obviously, the most interesting to us immediately. We 'sleep at the same time every day,' and 'get up at the same time every day'.

Humans are weird because we can be conscious and make choices about when we get up or go to sleep. But generally, most species, they get up and go to bed at around the same time every day.

Alie: Is that just because that's when night falls and they're more vulnerable?

Katherine: Yeah, there's some thought that your circadian rhythm, at least with a lot of wild animals is going to depend on whether or not you're a predator or prey, and what you are hunting, what food is of interest to you. So, an owl is going to be awake at night because it hunts mice, which are also up at night for the most part, most of them. So the owl is going to, of course, be nocturnal because that's when its food is available. [*"Soup's on!"*]

Humans, I think we have not adapted to be functional at night. We're kind of weird. We evolved to be able make the choice of when we want to get up or go to bed. For the most part, our food we were able to hunt during the day or at the late parts of the day...

Alie: Now you just take the Yelp app, toggle 'Open Now' and you're like, "What are my options here? 7-Eleven? Fine."

Katherine: [*laughs*] Yeah. "What's on Uber Eats today? Whose delivery fee is the cheapest right now?"

Alie: [*laughs*] I know. I wonder if that means that people, say, in New York, where they have more open-late options tend to have a different sleep cycle than people, say, in Sedona, which I visited, and their late-night eating options are shit. I ate fruit salad from Circle K after a wedding. SUCKED. Sedona on blast.

Katherine: [*laughs*] So, if you get married in Sedona, have a late-night food option at your wedding.

Alie: Oh god yes! My god, I was starving.

Aside: Y'all, I drove around Sedona, Arizona at 10pm. Nothing was open. I went back to my hotel. I had to eat the inside of a soggy tuna wrap, with a spork, in a cocktail gown. It was a beautiful wedding though. They're still married. I still like them.

Also, a circadian rhythm is something internally driven, but diurnal rhythms are just regarding the day or night cycle. So, an outside factor like light or temperature that affects your internal circadian rhythms, that's called a [*fake exaggerated Austrian accent*] zeitgeber, which sounds like an Austrian word for a wool bonnet or an antelope saddle. But yes, light.

Alie: Do you think that our environment even in the city versus a rural area, changes the way that we sleep?

Katherine: Absolutely.

Alie: Really!?

Katherine: There's probably some evidence and some research done looking at the differences between rural and urban populations. But I think there's two major drivers: one of them being light, and one being food availability. But I think the biggest difference, especially with humans, is going to be the difference between light exposure. While there might be some light out in the country, it's not gonna be as intense and bright as in the city where it's everywhere. You can't get away from it.

Aside: Okay, I ventured into the wilderness of research, and I stumbled onto one 2014 Portuguese study titled "Differences in circadian patterns between rural and urban populations: An epidemiological study in countryside." So, after analyzing the sleep questionnaires of a few thousand people, these Portuguese scientists found that compared with the urban population, the rural population had earlier sleep patterns – no doi. Rural folks also tended to have less of what scientists call 'social jetlag', which is when you sleep in later on your days off and then you feel WRECKED on a Monday morning.

But they did find higher light exposure in the rural population, a higher prevalence of psychiatric disorders in rural populations, but fewer metabolic diseases. There was also a Bengali study and their sleep questionnaires found that urban adult populations had crappier sleep than the rural, and the ladies slept the worst.

So here we are, thinking that the youth with their gaming devices, and meme screens, and late-night shenanigans have the crappiest sleep. But really, we've got a world of zombie moms and woozy women. Hormones to blame? Who knows?

Now, worst city in the U.S. for light pollution? I looked into it, and according to a study done this year by the website Sleep Junkie, Washington DC is the most light polluted. Sound pollution, you're wondering, look no further than my home, Los Angeles, which was rated the least peaceful place to live in America. I'm no data scientist, but is it any wonder that LA also ranks – and I looked this up – the highest in the number of Groupons sold for Botox? Let's just stay up all night tossing and turning, and easy-peasy, inject botulism in our faces to look rested. What could go wrong?

Katherine: There might be more of an inclination... maybe people who are night owls are more attracted to city life because there's more to do.

Alie: That's a good point, correlation not causation.

Katherine: Yeah!

Alie: So why do we need circadian rhythms? Does regularity make us healthier?

Katherine: So, I'll answer the first question; why do we need circadian rhythms? We know that our bodies, all species, have evolved with this 24-hour pattern of light and dark. Circadian rhythms are more so related to the 24-hour day. We think of this 24-hour pattern of sunrise and sunset. We've evolved to these conditions, so really, we think that it's a way to optimize our biology and our behavior so that we can be the most successful in fitness, and the most successful in terms of our reproductive ability, in terms of our survival. But the biggest thing is that we know that there's some sort of indirect or direct connection between circadian disruption and health.

Alie: What kinds of negative effects happen when your circadian rhythm is screwed up?
How am I gonna die?

Katherine: *[laughs]* So, there's thoughts that there's increased risk of cancers, but I'm mainly interested in reproduction and reproductive capacity. So, I know that there's some changes in fertility, there's changes in increased risk of reproductive cancers. There's increased risk of metabolic disorders, like type 2 diabetes. There's increased risk of obesity. Whether or not that's a bad thing, we're not 100% sure. There's increased risk of stroke and heart attack.

So, I've even seen things as crazy as – and a lot of these are in animal models – but when we disrupt circadian rhythms before an animal gets pregnant, the offspring has immunological deficiencies.

Alie: Oh my god. Oh my god. Oh, lord. Why is this happening? What types of protein messengers? Do you have any idea from a structural chemical standpoint why this is?

Katherine: So, there is this idea of internal synchrony among our different clocks. So, we like to say 'clocks' in the field, of course, because we are talking about time. [*It's about time.*] It's thought that there's one part of your brain that's considered the 'master clock'. That is called the suprachiasmatic nucleus. So, if you saw me on Twitter, my name is @SuperChiasmatic. There's a reason for that. I am a little bit of a nerd.

Aside: Again, that Twitter handle, @SuperChiasmatic. She's committed to this *[voice rises]* tiny-tiny piece of brain anatomy, and I respect that.

Katherine: So, this part of the brain actually sits right above the optic chiasm. So, it's in the part of the brain called the hypothalamus, which is involved in regulating a lot of very basic systems in the body. This little brain area receives direct information from light. It receives direct information from the retina, which gets stimulated when light hits it. So then that communicates chemically to that part of the brain. Then that part of the brain sends signals all over – to other areas in the hypothalamus, to other areas of outside of the hypothalamus in the brain, to the brainstem – which then those brain areas communicate to the body.

Aside: So the hypothalamus, side note, is a small area in the center of the brain that's partly responsible for hormone release and the suprachiasmatic nucleus, SCN, is a teeny-tiny part of that, and it registers info about light and dark, and it sends signals everywhere just to let your bod know what's up out there.

Katherine: So, there's this main clock in the suprachiasmatic nucleus, or SCN. And that is thought to orchestrate everything going on in the body when it comes to light exposure, so when light exposure goes wrong... But outside of the body, or outside of the brain, there are other clocks. There's a liver clock. There's a clock in your gut. There's a clock in your stomach. There's a clock in your muscles. When we talk about clocks, we're generally referring to a set of proteins and genes that have been shown to be rhythmic. Almost every single cell in the body expresses these same genes, but we don't know their function in every area of the body. In the part of the body that I mentioned before, the SCN...

Aside: Again, suprachiasmatic nucleus, SCN.

Katherine: ... we know that they respond to light and then their rhythms change in response to light, which is thought to lead to downstream changes in other proteins and hormones

and other signals that would communicate to the rest of the brain. But we don't exactly know their role in other body parts. So that's one thing that a lot of people are trying to figure out.

So, the concept of internal synchrony is that this SCN is at a specific pattern, and all of your other organs and tissues are in a specific pattern every day. But when something goes wrong, they get out of whack and they "desynchronize". So, it's thought that this desynchrony is somehow kind of tugging certain body functions to be performing when they might not supposed to be performing. Or the brain is trying to do something when the brain shouldn't be doing something. [*"Please, not now."*]

It's probably much more complicated than that. I know that there's some hormones that are thought to be involved in regulating it. Melatonin is a big one that a lot of people hear of. So, when you're exposed to light at night your melatonin rhythms get screwed up when you are exposed to light at night. Your cortisol, or what's thought of as your stress hormone, that gets messed up. So, it's thought that those signals can also attach to different body areas and signal, "Hey something's going wrong." It's likely that the chronic exposure to circadian disruption is what's causing all of these issues, so pretty much anybody in a city or a suburban area that's exposed to light at night.

Alie: Oh god. Tell me about your sleep hygiene. [*Katherine laughs hysterically*] Out with it.

Katherine: Oh god. So, it's kind of ironic because I actually run an Instagram account that's dedicated to self-care and mental health for graduate students. I am like one of the worst people to ask about this. [*"Now, that's the bad news."*] First of all, I have what I like to call sleep procrastination, and I didn't make up that term. I think this is a problem with a lot of people where we're like, [*frantic voice*] "Oh my god I have so much to do!" So, you watch *Grey's Anatomy* for 12 hours instead of doing anything. Then all of a sudden, you're like, "Oh it's 10:30-11 o'clock at night and I need to get stuff done." So, then you work until two or three or four in the morning.

Alie: Yes, you've read my diary. You're reciting my diary.

Katherine: [*laughs*] So, I'm definitely one of those. I try to sleep better, and honestly, like, my sleep hygiene only needs to be adjusted when I start to get stressed out. That's when I tend to need to hone in. But most of the time I'm on my phone in bed, I'm watching TV in bed. I'm so bad.

Alie: So much blue light.

Katherine: Yes, it's everywhere, it's everywhere.

Aside: So big cities have more light pollution, but what about the light you curl up with and personally jam into your retinas before bed? The blue stuff. Should we all be wearing glasses like Bono? Katherine says that the SCN is most sensitive to blue light.

Katherine: Whereas, red light, it's not picked up as well in the brain. So, you still sense it but it's not going to stimulate those cells that contribute to this light signaling in the brain. So, we see it, it probably has a minor effect, but it's not as dramatic and as intense as blue light.

Alie: Now what happens if... Let's say hypothetically you are a person who falls asleep with the lights on five nights a week. [*"It's me."*] What is happening in your coconut?

Katherine: So, I was thinking about this because I saw your question, I think it would be... When we close our eyes, we still see the light. The light is still coming through our thin little strips of eyelids. So, you're probably being exposed to dim light at night. Which is maybe not as bad as bright light at night, but it's bad. So, all the things that you would expect to come from light at night are going to be coming from having your light on while you sleep. The fact that you are doing it all the time...

Alie: [*giving up voice*] Yeah... yeah. I gotta work on that.

Katherine: Maybe you can get around it and like put the orange lights or whatever they are in your bedroom instead and it wouldn't be as bad, but then it's hard to see things.

Alie: That's very generous that you think that this is occurring in a bed and not on the couch [*Katherine laughing*] with a laptop under my face. So, sleep procrastination, I'm going to research an aside on how to, like, stop sleep procrastination.

Aside: Okay, side note. About five years ago a group of scientists from the Netherlands identified this phenomenon of sleep or bedtime procrastination and they defined it as "Failing to go to bed at the intended time while no external circumstances prevent a person from doing so."

So that last half of the sentence is like, "It's your own damn fault." So, what causes this? They think deficits in self-regulation, or having ADHD, or anxiety, or perfectionism, or work compulsion. I did some digging and one 2019 Turkish study entitled "Life is short, stay awake: Death anxiety and bedtime procrastination," found that fear of being a corpse eventually, is one cause for sleep procrastination.

So, less time awake means less time to be conscious, to experience life's rich pleasures such as watching dog videos and going down social media rabbit holes to see where your ex-boyfriend went on vacation. So, I read roughly 17,000 different blogs and websites about how to stop and there was advice like, "Take a nice bath at night," and, "Stop using your devices in the evening." "Give yourself an hour window to get ready for bed." Or, on your to do list for the day set a bedtime first and then work backwards scheduling your entire day.

In essence, the advice is like, "Suck it up. Realize your brain hates you for doing it and then knock it off, dipshit." Or maybe you could just go banish yourself to the woods for a while.

Alie: What about people who go on, like, circadian cleanses and they go camping or they don't use artificial lights for like a week? Does that reset anything? Does that help at all?

Katherine: It probably temporarily resets things. But let's be honest, if you go straight back to what you were doing before... The purpose for circadian rhythms is to be able to adapt to changes. So, we don't quite know if, like, one small disruption of circadian rhythms has lasting effects on the body. It probably doesn't. It's probably the chronic exposure, like I mentioned before. [*"This is the chronic"*] So if you only go away for a week and you're living in the wilderness with the moonlight, it's probably not gonna be as beneficial as just making more permanent changes at home on a regular basis.

Alie: That makes sense. Now, what about animals? Are there any animals that have really weird circadian rhythms, that are like up and down and up and down?

Katherine: Cats basically don't have... They have circadian rhythms, but not in sleep/wake activity.

Alie: [*surprised*] Really!? How does that work?

Katherine: They just sleep all of the time. They're carnivores. They don't have to worry about it. They eat whatever the heck they want. Well, house cats, they're lazy and they'll eat whatever food you give them. But if you think about cats, they've evolved to just eat whatever the heck they want, whenever they can get it. They're kind of at the top of their food chain. They don't have to worry about what food is available and when so they can kind of just be lazy and sleep, like, all of the time. I think they sleep like 16 hours a day or something.

Alie: Oh god. They're like koalas or something. Don't koalas and sloths sleep 16-20 hours a day?

Katherine: Yes, they sleep a lot. I don't know the exact numbers, but they do sleep a lot, yeah.

Aside: Side note. Of course, I googled the animals that sleep the most and giraffes apparently all have cocaine problems because they sleep 4 to 5 hours a night, get up and take a spin class or some shit, I don't know. But giant armadillos – get this – apparently sleep 18 hours a day, and koalas and little brown bats have been observed snoozing for almost 20 hours a day. But they were curious about sloths, so they fitted wild ones with little FitBits or something and they showed they only sleep 9.5 hours a day! That's not too shabby, sloths. Sloths are like, "Yeah, remember that time you needed a word for laziness, so you just called it us? Get bent."

Alie: What about some circadian flimflam? Any pervasive lies that you have a soapbox you want to get on?

Katherine: Yeah. I'm so excited about this question. Let everybody know: [*drum roll*] circadian rhythm is not a thing. [*DJ airhorn*] There is not a circadian rhythm.

Alie: [*gasps*] Not singular.

Katherine: It's not singular. Circadian rhythms, like the word circadian literally means 'about a day'. It's referring to rhythms that occur about a day. It's any rhythm in the body. You don't have a circadian rhythm. You have circadian rhythms, because there's so many different rhythms in the body that act on completely different patterns. So, we can't just refer to one thing. Now, I get that most people are referring to sleep/wake activity, that's generally what people think of. [*voice rises*] But that just one example!

Alie: So if you, say, go potty at the same time every morning, that's a circadian rhythm in and of itself.

Katherine: Yep. There is actually circadian rhythms in a lot of things. If you think of it, there probably is one.

Alie: Oh my god. Can I ask you Patreon questions?

Katherine: Yeah.

Alie: Oh my god. Okay, I'm getting to them a little bit early because we have so many. I highlighted a lot and there are so many questions that I wanted to ask but I want the patrons to be able to ask them. So, I'm just like, "Let's get into it."

Katherine: Okay.

Aside: Okay, but before we get into your questions, we'll take a quick break to hear about some sponsors of the show who make it possible for us to donate to a charity of the ologist's choosing. This week Katherine chose STEM Advocacy Institute or SAI. SAI is a global community of scientists, and science communicators, and professionals who are passionate about strengthening the network of access to science education and engagement.

They give fellowships to scientists like Katherine, and they believe that education with a strong foundation in science is a critical component for global economic growth, social advancement, and ultimately global peace. So a donation went to STEM Advocacy Institute and there will be a link to them will be in the show notes as well as to the sponsors, who you may hear about right now.

[*Ad Break*]

Okay. Your questions.

Alie: Patreon questions. So many millions of them. Forrest Stotts, hi Forrest, says: Why is mine so fucked up and what can I do to fix it? [*Katherine laughs*] Just straight up.

Katherine: So, I have to say #same. [*Alie giggles*] I would say our circadian rhythms – most likely referring to sleep/wake activity like I was just saying. They can get really screwed up for a lot of reasons. But I think the most common for most people is lack of structure. So, this might be an answer to a lot of questions, but having a very consistent routine, especially with when you are getting up, and when you are going to bed, and when you eat food, those are going to be the two most important scheduled things to have to help improve your rhythmicity.

Aside: This just in. I looked it up and rhythmicity is a real word! [*high pitched vocal shrug*] Hm!

Katherine: Our body loves consistency. Our brain loves schedules, even if a lot of us think we don't, but our circadian rhythms do. You know, you have similar circadian rhythms to a moth. [*Alie laughs*] You're not as complex as you want to think you are. So, having a consistent schedule, especially with light, and food, and sleep, those things are going to be the most beneficial for fixing your rhythms.

Alie: Oh my god, I feel very attacked, very seen. Alli Brava [phonetic] wants to know: What's the best way to get blue light in the mornings when you wake up before the sun comes up? Is blue light in the morning good for waking us up?

Katherine: It looks like there's some evidence for what they call 'dawn simulation'. So, it's similar to those fancy alarm clocks that you can buy that [*higher pitched dreamy voice*] slowly bring light, or using a bright light simulator. So, you can have one of those desktop ones that people use for seasonal affective disorder. Using something like that in the morning can kind of trick your brain into thinking, "Oh, the sun's up. It's morning. It's time to do stuff." So, there's been some evidence to show that that actually improves our attention and improves our cognitive performance in the morning, as opposed to not using one.

Alie: Are alarm clocks kind of evil when it comes to circadian rhythms? Or are they just a tool we need to stay on track to our circadian rhythms?

Katherine: I think that they're a tool we need now. I've noticed that mine has a really bright light that I can't dim, so I should probably get rid of it and get a new one. I can actually see

it through my eyelids when I'm trying to sleep. But yeah, I think they're more so a tool to kind of keep you consistently on schedule, especially when you have to get up and go to sleep at a specific time of day and you don't have as much flexibility.

Alie: Man, what we really need... Hear me out, we need alarm clocks that are sleep clocks, that are like, "Aaannd you are in bed." [*Katherine laughs*] Do you know what I mean? Like, we need a 10:30 alarm that's like, "Okay, all right fucker time to brush your teeth."

Katherine: Have you tried doing that on your phone?

Alie: No, but tonight might be night number one. [*both laugh*]

Aside: Okay, side note. When it comes to waking up, if you are in the market for a new morning alarm clock, I looked for the weirdest for you. There's one called Clocky, and it's on wheels and it runs away from you until you catch it and turn it off. Or, I guess, set it on fire if you want to. There's another that requires you to shoot a laser pointer at a target before the alarm shuts off. There are bedside mats that you have to stand on before they'll stop wailing. There's the terrifying-sounding Shock Clock, that seems to zap your wrist, maybe?, with an electric current until you accept that it's a new day. There's another that's called the Sleep Squad that utilizes a police siren, every morning. I don't know why they called it Sleep Squad when you could've named it the Wakey Brigade.

Also, I found a \$450 option that makes pour over coffee at your bedside. I don't know why you couldn't just use a \$30 Black & Decker coffee pot with a timer instead. It's none of my business. But in terms of the most potentially sculptural, there is a contraption called a Dreamtime water alarm, and it relies on you filling it at night and then a steady drip of water all night changes the balance on a scale, until a soft bell, ding, gets hit in the morning. It does not, however, spray you in the face, which I was looking for when I stumbled upon it.

Oh, when it comes to light-based solutions, there are all manner of sunrise alarm clocks. They have great reviews. There are higher end ones by Phillips that are a couple hundred bucks, to the \$20 hOmELabs options, because all of us know too well the sound of an iPhone alarm [*fast-beeping phone alarm*] brings deep, terrible, morning dread. Now what about if you use it the night before, you wanted to know.

Alie: Logan Laveau asks: Is using my phone for a while before I sleep actually fucking me up like my dad insists? Mr. Laveau.

Katherine: [*laughs*] Honestly, because we also have lights and tv on, just your phone is probably not as bad as we want to think it is. There's a lot of other light factors that are fucking us up, let's be honest. But there is some thought that because of how bright it is and how close it is to our faces that it might be more stimulating than a TV across the room or a dim white light in your lamp with a lampshade. So, it is possible that it's more fucking-up-ness but we're not 100% sure.

Aside: New words, rhythmicity and fucking-up-ness. So, put those in your pocket. Now, a few of you had sleep mask questions. I'm looking at you Emily Reed, Juliebear, and Amanda J. Well, I'm looking in your direction, but I don't see anything because of the mask thing.

Alie: Do you have a sleep mask that you prefer? Do you sleep with a sleep mask?

Katherine: I do sleep with a sleep mask and I bought whatever was relatively affordable on Amazon. As long as it blocks out all the light and doesn't, like, fall on my face. I sleep with a blanket on top of my head though, to be honest, because my partner snores. And I sleep with a sound machine and two fans because I'm a mess. I have a travel fan that I actually fly with me when I go places.

Alie: Oh my god, I love how prepared you are.

Katherine: I'm very picky when it comes to sleep so I try to do as much as I can to make it happen.

Alie: There's this great invention that I covered it on *Innovation Nation*, and it's called a bFan. It's a fan that sits at the foot of your bed and it goes up in the bottom of your covers and it targets just one person in bed. So, if one person isn't hot and the other is, it goes up and it goes under your covers, it's so magical, it feels like you are in a marshmallow. It's called a bFan. The guy who invented it, invented it for his mother-in-law who was going through menopause.

Katherine: That's awesome.

Alie: Yeah, I know. I've been in a bed with it and I'm like, "That's really nice."

Katherine: Yeah, this is a side note but it's relevant to what we are talking about. Temperature is very important for sleep. People who are like "I like to be hot when I sleep." No, your body actually decreases its temperature at nighttime so you sleep better. It's actually better to have a slightly cooler space when you are trying to sleep.

Alie: Do you think that's because evolutionarily we just got used to night being cold?

Katherine: Probably. It's always relatively cooler at night than it is... I shouldn't say always, but most of the time relatively cooler at night than it is during the day.

Aside: Okay, some of you wanted to know if sleeping under a tree outside, might help your screwed up circadian rhythms, like Anna Thompson, Monster_Cat and...

Alie: Anita Struzinski asked: At home I'm a night owl. When I go camping I so easily fall into the rhythm of sleep when it's dark, awake when it's light. Why does this happen so readily? And is that what my body actually wants?

Katherine: Yes.

Alie: BLAAHHHH!

Katherine: And you're probably away from a lot of light pollution. Our bodies developed with this. Our brains developed with this light/dark cycle. So if we go back to... Again, we can easily adapt to the light cycles, but this is naturally what we would normally be around. Now, will it be the same in 1,000 years – if the planet still exists – when we have adapted to light pollution? I have no idea, but at least for now, we adapted and we evolved to normal light/dark cycles being the Sun and the Moon, and the Sun and the lack of sun. So, of course we're gonna feel comfortable and happy, at least our sleep will, when we're back with nature.

Alie: Mmhmm. That makes me want to go camping and, like, cover myself in DEET.

Aside: Just do me a favor. [*computer voice: "Check your crevices."*] Thank you. Now, all of us, I'm sure, want to know about the blues, and the blue light, and anxiety, and sleep, such as, Evan Jude, Chris Brewer, Heath Allyn, Becca Bee, Megan Luschen,

Hanna M., Sarah Wingfield, Cranilton, Hassan N, and Sarah Clark, and Kasey Rose and...

Alie: Becky Baker says: Why do I need sleep 14-18 hours a day when my depression flares up? Also, asking for a friend, is that why some people have clean houses and obedient children?

Katherine: [laughs] So, this is a good question. I think that... I'm not 100% sure, but I think with depression one of the symptoms is fatigue, so it might be that we are trying to combat fatigue with more sleep. Instead of our normal whatever, if you're Alie, probably 3 hours of sleep. [Alie laughs] If you're me, like maybe 6-7 hours of sleep. Normally that's what we get, but then we try to make up for feeling fatigued when we're depressed by sleeping more. Depression and sleep are very, very tightly tied together, so it's really hard to figure out which comes first. Are you depressed because you're lacking sleep or are you lacking sleep and feeling fatigued because you're depressed? It's likely some combination of the two.

Aside: Okay, side note. I looked into this and I'll give you just the gist. Mental health and sleep are very linked. Sometimes sleep issues are a symptom of mental illness and sometimes they can cause mental troubles. Often, they keep cyclically making the other worse. So what can you do? You can see a doc, but before you go in you might want to keep a sleep journal for two weeks to show them when you slept, for how long, what troubles you had.

Doctors also suggest a bedtime schedule and routine, of course, very helpful. As is limiting stimulants altogether, or at least in the afternoon. They suggest getting plenty of sunlight or using a light box that mimics the sun if you have Seasonal Depression, especially up here in the US where we're in the darkest days. I'm not talking politically; I just mean winter in the northern hemisphere. Speaking of which, some Patrons had seasonal and latitude questions, such as Misty Clardy, my Montana cousin Nathan Bronec (Hi!), Michelle Lee, Deli Dames, and...

Alie: First-time question-asker Evan Jude asks: How many humans, plants, and animals, who live closer to the poles and who experience continuous daylight and nighttime around the winter and summer solstices, like 'white nights' in Russia, how have they adapted or evolved differently? How do they deal? And have you seen, *Midsommar*?

Katherine: I haven't seen *Midsommar*. Do I need to see it?

Alie: I think it's about a 'white night'. I think it's a horror movie that takes place in a continuous daylight night. WHAAAA!

Katherine: So, my friend is actually one of those people that's lucky and gets to go to Antarctica. So, I've tried to ask her – like yes, yes, she's boss – I tried to ask her what it is like there, because they go during the Antarctic summer, which is our winter. But it's light all the time down there. You know, she said that, "Yes, it's harder to get sleep but most of the time they have ways to control the light and dark in their facilities." But there's really not a lot of research done on the people that live in these polar areas. I recently saw an article that they're finally starting to do studies on the resident scientists that live in Antarctica, which is like... That's the perfect population of people. It's a very controlled environment, very controlled food, a lot of controlled factors.

So, I think they're finally going to start looking into it because my educated guess would be that there is probably higher rates of depression. There're probably higher

rates of things that we associate with continuous light exposure. We haven't adapted to those areas yet, as far as I know. I could be wrong. But there's probably increased risks of all these morbidities that we associate with light-at-night exposure and these people who are at the higher or lower ends of the Earth. Also, during the winter, their respective winters, I think that's probably where the increased depression might poke itself through because they're not getting enough light. Like, we need light. Even if it's not warm outside, we need light exposure.

Aside: Quick aside. I poked through some reports about mental health and latitude and found one really fascinating study which looked at how rare suicide was in pre-colonization Greenland versus modern lifestyle. Apparently, birth month and birth season tended to affect those kind of mental health issues. And while those types of deaths increased a lot post-colonization, the seasons had less of an impact because of the introduction of artificial light. So, knowing the amount of light and darkness that our suprachiasmatic nucleus receives can have a major impacts on our hormones and mental health. What about when we futz with the clock itself and throw the whole system off twice a year?

Alie: Juliebear asks: Daylight Savings Time, abolish or keep?

Katherine: ABOLISH!!

Alie: Okay, she says, "We can't be friends if you say keep."

Katherine: Actually, the Society for Research on Biological Rhythms just released a statement about why we should abolish the Daylight Savings Time. So, the people who are in charge of studying circadian rhythms and other biological rhythms are like, "Get rid of it!" So, it's a waste. We don't need it anymore.

Alie: And don't they say that when they shave off an hour of sleep there's a lot of heart attacks and a lot of health problems occur, like, the following week after? I read that somewhere.

Katherine: It's basically jet lag. We're forcing jet lag on people.

Alie: Aw, that sucks. I know that there are questions about jet lag.

Aside: We're going to get to those in a sec, but first another very important question.

Alie: Juliebear also wants to know: Do you giggle and snort when you hear and say the word 'diurnal' because it sounds like a pair of urinals next to each other?

Katherine: [giggles] Yes. [giggles more]

Alie: Good.

Katherine: It's a fun word. It's a fun word.

Alie: Good. That makes me feel better.

Aside: Patron Alyssa, also asks this next question.

Alie: Paul D Simmons says: I have read that folks who are blind even with no light perception still have melatonin cycling and diurnal rhythms. So, what alternative mechanisms, other than visual perception, do our bodies have to regulate our circadian rhythms? Like does our skin know that it's light out?

Katherine: Our skin doesn't know but I'm actually really excited about this question because we didn't get to talk about these little guys. So, it's not actually the visual cells in our retinas that recognize light. They do, obviously, but not for circadian rhythms. They are just doing it for visual perception. So, there's actually these other little guys. They're called Intrinsically Photosensitive Retinal Ganglia Cells, or IPRGCs. I think they make up less than like five or ten percent of the cells in your retina.

They sense light, which most of the cells in your retina do, but they sense light and send it specifically to that suprachiasmatic nucleus, or SCN. So, they're the ones that are like, "Hey, Master Clock, light is happening right now." So, they're the ones that are communicating directly to that brain area.

Now, depending on why an individual is blind, there are different reasons why a person might be blind, if those cells are still intact, they're still going to have circadian rhythms. They're still going to be fine when it comes to perceiving light and dark in the sense of regulating biological rhythms in that way. So, if there's a different reason and those cells are no longer intact, they will actually no longer exhibit circadian rhythms... Well, they will but their bodies are basically constantly in what we call, 'free running', which is as if you were to throw somebody in a cave in the back of a cave and have them be completely isolated from environmental queues.

Alie: Oh wow.

Katherine: So, it depends on why an individual's blind, but some individuals who are blind can still have sensing of light through those specific cells.

Alie: That's crazy. That's cool. New question-asker, Lauren Marie asked: Why do I feel like a sack of shit in the mornings when I've had 8 hours?

Katherine: *[laughs]* Oh geez, it could be a lot of things. So, things that make you feel like sacks of shit even if you get enough sleep, or what we think of as enough sleep. Maybe you consumed something? Some substance that made your sleep crazy. So, alcohol puts you to sleep but does not help your circadian rhythms at all. It makes your sleep cycles kind of wonky. I don't know the specifics, but I know it's not good.

Aside: Hella fast: I looked this up, and alcohol can inhibit REM sleep, which is the most restorative type of rest. It can also wake you up in the middle of the night and make you go potty.

Katherine: I mean, it could be that this person needs more or less sleep. That could be a fun experiment to give a try. Some people do better with exercising at specific times of day, so depending on when this person is exercising... I've read some places that, like, heavy exercise in the evening is not good. But then I know anecdotally, I can go to a boxing class and be fine. I think it just depends on your needs. I don't think there's a straightforward answer for why specifically 8 hours of sleep makes you feel screwed up. It probably depends on a lot of factors.

Alie: That's a good call. So many patrons asked, and I will put their names in an aside, and I will read them quickly.

Aside: These folks are: Elise Knowles, Don Schwartz, Jon Yurek, Renee Jennings, Megan Pearson, Katherine Harshman, Mark James, Michelle Lee, Becca Decker, Celia Ford, and Hallie, who all asked about naps and...

Alie: ... about segmented sleep and this notion of, like, sleeping and then waking up in the middle of the night for a couple of hours and going back to sleep. Is that really a thing?

Katherine: I have not found any definitive evidence indicating that that is actually beneficial. [*Go on.*] At the same time, I haven't found any definitive evidence saying that it is hurtful. Now, the only thing that I can think of that would make this bad would be if you're exposing yourself to more light at night because you are waking up in the middle of the night. So, if you're getting up in the middle of the night it probably is not a good idea to then get on your phone or go watch TV for 3 hours, and then go back to sleep. I don't know what you could do... Well, I do know a few things that you could do in the dark. [*boing, wolf whistle*] But, I think you'd have to maybe try something that's not getting you exposed to more light.

There is some evidence that things like napping during the day, as long as you don't take long naps, that that is a normal aspect of human sleep patterns. Especially because we eat a lot during the day. It's hotter during the afternoon, generally. So, those types of queues are, like, making us sleepy. So, we take a little quick nap and then we're fine; we can get up and move on. But I haven't seen a lot of evidence about segmented sleep, especially at night that I've heard a lot of people talking about lately. I think it was a historian or somebody who brought this concept up and that's kind of all we've gotten since then.

Aside: Okay alongside rhythmicity and fucking-up-edness, this is another good pocket word and it means 'of the dawn or dusk of the gloaming', it's great. Crepuscular.

Alie: Ira Gray wants to know: What is up with crepuscular animals? How does that work and how is that cycle advantageous to them?

Katherine: I think it comes back down to, what are these animals eating? What are they foraging for?

Alie: I love this question from Vidie Pong: Does early to bed and early to rise actually make you healthy, wealthy, and wise?

Katherine: I'm gonna say, it depends. So, depending on what your chronotype is... Chronotype is... Traditionally we say night owl or day lark. Whether or not you are a person who functions better during the evening, or functions better during the morning, or somewhere in between, that's probably going to make you more wise, sticking to that schedule. Healthy, probably depends on your light exposure. Again, it's all coming back to light. Then wealthy, well, good luck. That's all I have to say.

But I think that the biggest thing is going to be related to chronotype. But then also depending on what job you choose, and maybe there's some correlation between our chronotype and what jobs we tend to gear toward. But yeah, I would say chronotype is probably going to be the biggest determining factor, which is thought to be potentially genetic.

Alie: Yeah, and so many patrons asked that question.

Aside: Many of you little birdies had chronotype questions, i.e. night owls versus morning larks. Such as, Stephanie Broertjes, Sarah-Jane James, Chelsea, Fruit Fly, Molly Henning, Jasmin McLean, Michelle Minert, Anna Thompson, Hanna Claire [ph.], Rachel Mount, Sophie Cousineau, Emma Gildesgame, Theresa Bossenova and Justin M.

Gifford, Charlotte Fjelkegård, Jenne Bergstrom, Kelli Brockington, Erin, Pandora II, first-time question-asker Lara Durgavich, Erica Butler, Madelyn Winter, Brie Johnson [ph.], Charlie Wong, Heather Woodford, Beatriz Bevilacqua, Heath Allyn, Kayla Perez, Sarah Sexton, and Aarika.

Alie: Is there a such a thing as a night owl or an early riser? Is that a thing?

Katherine: Yes, it is a thing. It's a thing too depending on age. So, our chronotype actually does change as we age. Obviously, like, children tend to be more day larks. Teenagers are night owls, that's not a lie. It is actually a thing. Then as we get older, we move more and more toward day larks. Older individuals tend to wake up earlier in the day, but their sleep is all screwed up anyway.

Alie: Wait, why is their sleep screwed up?

Katherine: So, one thing is change in hormones. So, lack of hormones or extreme levels of hormones compared to what would normally be occurring during reproductive age. But then it's also thought that the areas that are most involved in regulating circadian rhythms age as well. We don't know what that aging looks like. But it's thought those brain areas, just like other brain areas, could potentially be aging and not functioning as properly as they normally would.

Alie: Oh wow, yeah, one patron asked about older folks and why they get up so early. Greg Walloch asked: Ever since I got a weighted blanket, I fall asleep with the lights on constantly, is that bad? But Greg Walloch wants to know also: Do you like the song, "Daysleeper" by R.E.M. where Michael Stipe actually croons about circadian rhythms?

[clip from Daysleeper:]

*All talk of circadian rhythm/I see today with a newsprint fray
My night is colored headache gray/Daysleeper*

Katherine: Is it bad that I haven't heard it?

Alie: I'm going to have to send it to you. How dare you! How dare you!!

Katherine: *[begging voice]* Please, please.

Alie: You're not getting a PhD until you can karaoke that entire song.

Katherine: I know, I know like really popular R.E.M. song, but...

Alie: Well, this is about to be perhaps your favorite. I'm gonna send it to you. Oh, I do want to get to one more that so many patrons asked...

Aside: Patrons I'm looking at you, Barb Wilkinson, Amanda Rincon, Sarah Lucchesi, Sam McCarthy, Jim Spickard, Danni Q., James Capaldo, Riley McInnis, Emily Tudorache, RJ Doidge, Rachel Fallon, Janna Wisniewski, Joey Tab, and Heather Densmore. Y'all had some really jet laggy questions. Mainly: how not get this?

Alie: What strategies for combating jet lag are there without using medication? Do we just have to suffer through it? Are there behaviors we can adjust to make it go faster and more easily? What is jet lag? What is happening?

Katherine: So, jet lag, I think, is generally thought to be again the desynchrony between our internal pattern and what we are used to versus whatever is happening outside of us. We are basically going from, "Hey, I'm used to east coast time," or central time, or whatever. You're used to that light pattern and then all of a sudden, literally within a

few hours, you're in a completely new lighting pattern, and completely new social queues, completely new food queues.

So all of a sudden, your body is like, "Oh shit. What's happening??" That's the actual scientific term. [*repeated, drawn out: "Oh, shit. What's happening??"*] So, it's thought that maybe the brain is slowly but surely trying to catch up, and different parts of our bodies can catch up with this new timing at different rates.

I would say there's two, maybe three, things that seem to hold the most weight in terms of resynchronizing yourself to your new environment. Depending on how long you're going to be there, honestly. If you're only going to be somewhere for a couple of days, it's not worth your time. Just deal with it and go back home and go to normal. But if you're going to be somewhere for like a week or so, I would recommend trying to resynchronize your schedule to whatever your new schedule is, but doing so in smaller increments.

If you could change your schedule every 15 minutes, every couple of days, that's probably going to be more beneficial than you just trying to make it all happen at once. Yeah, there's some thought that we can adjust... 15 minutes is just a magic number, that it's easier to that change than like an hour, or two hours, or three hours. Now, that's hard to do when you jump from New York to Sidney. Your brain is probably a mess.

Then eating on a regular schedule, trying to sleep on a more regular schedule, even socializing on regular schedule, that will help queue your brain and your body to know what time it is or what the new time is.

Aside: Oh, and I realized later that we didn't touch on circadian rhythms in shift work, enough. A bunch of you, many of you, too many of you to list had questions, like McManasaur, Michael, Dawn Ewald, Nelson Villatoro, just a few of you. So many others of you asked, essentially: What can shift workers do or how bad is shift work? And I wish we talked about it more, so I emailed Katherine, and I asked, "How fucked are shift workers?" She wrote right back, and I shall read it verbatim:

Generally speaking, shift workers are fucked. We don't quite understand why, but when looking at disease risk, shift workers have increased risk of developing a multitude of diseases, including cancers, metabolic disease, cognitive decline, et cetera. We don't know why. It's likely a mix of our physiology going out of whack. Like your hormones go crazy, your immune system goes nuts, and so on. This is obviously mediated by sleep disruptions, but we don't know to what extent.

Another interesting tidbit, she says, is:

It's not just the light exposure during shift work that's fucking us up. Our brain and our body are like, "Ahhh! What time is it?" So, your liver thinks its noon because you're eating, but your brain thinks it's 2am because it's dark outside. We don't know exactly what's going on here, but shift workers are a mess, physiologically speaking at least.

So, shift workers, my heart goes out to you and your heart, I know it's so hard. We did a two-part Somnology episode last year, and as we noted in that one shift work is listed as a carcinogen. Yikes. And I don't know what the answer here is because shift

workers are literally saving people's lives and oftentimes you don't have a choice as to what your schedule is for work. You have to go where they pay you.

So, be nice to a shift worker. I think that there should be a National Shift Workers Day. We should all have to get up and give you presents in the middle of the night just to see what it's like one time. I don't know. I want everyone to take care of themselves as best they can. So, the main point, let's get control of our sleep, people. Do what you can. A lot of folks asked about how much control though is too much? Like, what about sleep hacking? Rebecca Windell, Joey Tab, and Ron LeBlanc wanted to know:

Alie: What do you think about all the tech bros that are trying to hack their sleep and intermittent fasting? Are you like, "Come on!"?

Katherine: I'm sure there might be some small benefit to it. I've heard recently of people trying to hack fertility using light. I'm like, [*skeptical*] "Maybe? Maybe?" I would say, if it doesn't hurt you, sure why not? But there's not enough evidence to say that it actually works. So, that would be my one caveat; go into it knowing that we don't know if it works at all. I've heard of people like trying to hack circadian rhythms or force themselves to be one way or another. To some extent we can, but we only have so much control over what our body naturally wants to do.

Aside: P.S. I just went down a rabbit hole reading about people who sleep on magnetic pads and they tape electrodes to their face and nap for a few hours at a time all day and all night. Folks who strap ice packs to their body. Sounds like a giant pain in a biohacker's ass.

PS, do you need to fall asleep quickly? I shared this in the Somnology episode, but my mom taught me a brain trick where you think of a category, like fruits, or movie titles, or things you would find in a purse, and then think of something that starts with an A, and then something that starts with a B, and a C, and on and on, alphabetically, until you drift off. We call this, The Fancy Nancy. I hope it helps if you need a tactic to lull you into dreamland. I use it all the time. Thanks, Mom. Okay, moving on.

Alie: Last Patreon question, Ali Cooper wants to know, "Blackout shades, friend or foe?"

Katherine: I would say friend.

Alie: Okay. So even if the light doesn't come in the morning, is it better if you use blackout shades and then you just, like, wake up at six? Like, "Alright, light, here we come"?

Katherine: I would say... Maybe in an ideal world, if you could have black out shades, red or amber light bulbs in your house at night, and then maybe one of those fancy sunrise alarm clocks, things like that that can slowly simulate a normal light/dark cycle, that's probably gonna be the most beneficial to us than just one thing. If you just put up blackout shades, you're right, you're going to be blocking out the daylight in the morning, so it might be harder to wake up. But then if you add a little sunrise simulator that's gonna wake your little butt up easier in the morning.

Alie: Or we could all just sleep on the porch with no light pollution. [*Katherine laughs*] That's never going to happen.

Katherine: Yeah, have this big old ugly streetlamp that's like right outside my bedroom window that just makes me sad every time I see it. "You're killing me slowly!"

Aside: What else just kills her?

Alie: Okay, worst thing about your job? Shittiest thing about your job? What sucks? Other than me cramming you into this like tiny hot recording booth in July?

Katherine: Honestly, the recording booth isn't that bad. It's the literal... I don't know if you can see it, the foot stool that they put in here. [*Alie laughs heartily*] My butt is so sore. It's fine. It's like basically like simulating a squat for an hour and a half. My thighs will be glorious.

So, I wanted to say emails because they suck. But I'll be honest, I'm someone who checks my emails 30 times a day because there's something satisfying about getting an email. I feel like I'm wanted.

Really, the thing... Anybody who's potentially interested in doing circadian rhythms research, there's this running joke, that in order to study circadian rhythms we have to fuck up our own. [*Alie laughs*] So, my master's experiments, I would have to go in from ten to eleven at night, and then be back in lab at 6am in order to run my experiments. But I've done experiments here at Illinois where I had to be in lab from like 7pm to like 5am checking animals. Circadian rhythms research: be prepared to not have any more circadian rhythms; just fuck them all up.

Alie: Oh my god. This is like doctors. Doctors have the worst health.

Katherine: Yep.

Alie: What is the best thing about what you do? What do you love the most about it? Or about circadian rhythms?

Katherine: So, I'll answer this with two things, so I'm gonna cheat. My favorite thing about being a scientist in general is that moment where your data start to slowly make sense. And they never really fully make sense because that's life, but when you start to create a story with your data, it's some of the most exciting moments of your life as a researcher. Then you get to talk to people about it, either through podcasting, or through social media, or through conferences, or writing papers. It's some of the most exciting times of being a researcher. Then you also start to develop new ideas and new questions because science never ends.

About circadian rhythms in general, we didn't get to talk about this, but circadian rhythms don't just regulate hormones, but they also are regulated *by* hormones themselves. So, estradiol, or estrogen, and testosterone, and cortisol, and all those fun hormones that we like to talk about, those actually feedback and regulate circadian rhythms, too. So circadian rhythms don't just do things, but they also then get feedback and get regulated by not just by environmental queues, but also internal queues, too. And I think it's just so fascinating. It comes back to my love of homeostasis again. I don't know why, but it exists.

Alie: So I'm realizing, in summation, I can't treat my body like a robot. I'm a human organism. And I have to treat it at least as nicely as I would my dog.

Katherine: YEEEEAAHHH! Love your dog, love you.

Alie: Right! I would never expect a poor dog to, like, not eat for most of the day because it was working, and then give it a bunch of donuts and Pepsi, and then keep it up all night, and be like "What? Why do you feel like shit?" You would never do that to an animal.

Katherine: No. We're not machines.

Alie: This is interesting. I feel like the takeaway from this is that we're fragile beings.

Katherine: Yeah, we need love and tenderness.

Alie: And sleep and food on a schedule.

Katherine: And schedules and routines even though we hate them.

Alie: Oh my god. So, routines are our friends. UHH! Why have I resisted!

Katherine: Well especially for people have sleep... Now, insomnia is a completely different beast. Insomnia needs tender loving care from a different perspective. But just like sleep procrastination, general sleep difficulties like trouble getting to sleep that's not related to insomnia, get a damn schedule.

Alie: Get a damn schedule. Thank you, Almost Doctor. Almost doctor's orders.

Katherine: [laughs] Yep.

So, for more on Katherine Hatcher and the podcast *Endocrine Disruptors*, co-hosted by Shreya Patel, go to EndocrinePod.com. Katherine is on [Twitter](https://twitter.com/Superchiasmatic) at @Superchiasmatic. There's a link in the show notes. There are also links to all the sponsors and to the charity STEM Advocacy Institute. I'm @AlieWard on [Twitter](https://twitter.com/AlieWard) and [Instagram](https://www.instagram.com/alieward). Say hi over there. We're @Ologies on [both](https://www.youtube.com/channel/UCqWz8v8v8v8v8v8v8v8v8v8). More links are up at AlieWard.com/Ologies/Chronobiology. You can check out the show notes for more links, including links to [merch](#).

Thank you to Boni Dutch and Shannon Feltus for managing the merch. They have a podcast called *You Are That*. They're so charming and funny. And to Erin Talbert and Hanna Lipow, for adminning the *Ologies* Podcast [Facebook Group](#). Thank you to Assistant Editor, Jarrett Sleeper of Mindjam Media and the mental health podcast *My Good Bad Brain*. Thank you to Emily White and all the transcribers in the *Ologies* Transcribers Group. I see you, I love you. Bleeped episodes for kiddos and transcripts of some of the episodes are available at AlieWard.com/Ologies-Extras; link in the show notes.

And of course, thanks to the man who is guided not by light or by dark but the beacon of ambition from his mustache, Lead Editor Steven Ray Morris, who also hosts *The Purrrecast* and *See Jurassic Right*. Please get some more sleep, Steven. The theme song was written by Nick Thorburn of the band Islands, which is a great band.

At the end of the episode, you know I tell you a secret. And this week, I woke up and I was like "Mm, I love the smell of a Christmas tree in the house." Then I remembered that we don't have one, and that I had left a pine-scented candle burning all night in my office. I'm very lucky nobody died. It smelled so good. But the phthalates were literally, likely, killing me. So please get some sleep. Please do not do it with any candles burning. Let me be a lesson; I got very lucky. Get some shut eye, your suprachiasmatic nucleus is begging for it, as am I. So be good to yourselves, li'l monkeys. I'm so glad to be back. I slept so much when I had the flu and that, coupled with this episode, perhaps has changed me forever. I'm kind of like, "Sleep. It's cool now. I get it."

Okay, berbye.

Transcribed by:

Scott A. Metzinger

Edits by Kaydee Coast, who reminds you don't lick toads or slugs, check your crevices, and milk your thumbs. Kthxbi.

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