

Sawbones 449: Marvel Anatomy

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Clint: *Sawbones* is a show about medical history, and nothing the hosts say should be taken as medical advice or opinion. It's for fun. Can't you just have fun for an hour and not try to diagnose your mystery boil? We think you've earned it. Just sit back, relax, and enjoy a moment of distraction from that weird growth. You're worth it.

[theme music plays]

Justin: Hello everybody, and welcome to *Sawbones*, a marital tour of misguided medicine. I am your cohost, Justin McElroy.

Sydnee: And I'm Sydnee McElroy.

Justin: And I am so excited to be here with you today Sydnee, because we have a very special episode.

Sydnee: That's right, we do!

Justin: First off, it's Max Fun Drive. What does that mean, Sydnee?

Sydnee: Well, as you probably already know, Maximum Fun is a listener-supported network. We count on you, our faithful—trusty? Trusty listeners?

Justin: Trusty is fine.

Sydnee: Trusty listeners? Um, to help us keep making the stuff that you enjoy, that we love making and we love making more of and making better for you. And your support helps us do that. So, once a year we try to do something a little special, a little different, while we also come to you and humbly ask to help us out. Whatever you can donate we really appreciate. If you're already a member, thank you so much. If you're in a position to upgrade your membership, this is a great time. And if you have thought about it and are ready to take the plunge, this is the best time to join, because we give you presents. We give you gifts.

Justin: Mmm!

Sydnee: And what's better than presents, Justin?

Justin: Uh, nothing.

Sydnee: Nothing?

Justin: Nothing.

Sydnee: Nothing? I didn't expect that answer, actually.

Justin: Nothing's better than presents. Um, Syd, I have such an exciting time today, because this is going to be kind of an education... mainly for you, but also for me. My dad gifted you, for the holidays, the Marvel Anatomy... I guess textbook would be the way I'd put it. It's written by—

Sydnee: That's a—that's a... [laughs] I word you could use.

Justin: Marc Sumerak and Daniel Wallace, with beautiful illustrations by Jonah Lobe. This is a book about how the anatomy of the Marvel Universe works. So what I have done here is, you seem pretty smart about one kind of person, and what I have a book here is, like, lots of different kinds of people that maybe you could learn a bit more about so you're ready in the field.

Sydnee: Okay. And by different kinds of people, you mean... fictional.

Justin: Huh.

Sydnee: People.

Justin: Yes? Um, that's... yes, okay. Um, yes.

Sydnee: So what do you think are the chances that increasing my knowledge in this specific area of [hesitantly] medicine... ? I say with a question mark.

Justin: Medicine.

Sydnee: What is the likelihood this will help me in my career, or help a patient that I may care for in the future?

Justin: Uh, nil!

Sydnee: Great.

Justin: So what I've done is I've put a random number generator—

Sydnee: Fun.

Justin: —for page 18, that's where it stops being about the Skrulls, because who knows? And then it goes up to page 225, which is where the index is—

Sydnee: Being about the what?

Justin: The Skrulls. They're confusing.

Sydnee: [laughs]

Justin: But the first one that has come up for us today is Captain Marvel.

Sydnee: Yeah.

Justin: Captain Marvel has, uh...

Sydnee: I saw a little bit of that movie.

Justin: Yes, okay.

Sydnee: Not all of it, though.

Justin: Now, Captain Marvel was a US Air Force pilot, and her name was Carol Danvers, and now she has a hybrid DNA which mixed her and Kree, which are like anti-Skrulls kind of, okay?

Sydnee: Are these aliens?

Justin: Yes.

Sydnee: Okay.

Justin: Um, okay. So you know that, uh—

Sydnee: So she's half-human, and then half-fictional alien creature that we have no—like, that does not exist on this... plane, as far as we know. As far as we know.

Justin: Right.

Sydnee: Allowing for the possibility that there's life of which we are not aware.

Justin: Okay. So Carole—Captain Marvel's mother was a Kree soldier named Marielle. so this is all I'm gonna tell you here. When you tell me, how does she shoot energy out her hands?

[pause]

Justin: [wheezes quietly]

Sydnee: Um...

Justin: What I need you to tell me here is, Syd, how's she shoot energy out her hands?

Sydnee: I—are you looking for me to hy—like, hypothesize—

Justin: Yep.

Sydnee: —scientifically?

Justin: Mm-hmm?

Sydnee: Oh, Justin. I don't know that there's a... I mean, I guess the closest approximation would be... you know when you, like, are wearing fuzzy socks and rub 'em on a carpet?

Justin: Mm-hmm. Okay.

Sydnee: And a buildup of static electricity. Like, extra—you got extra electrons floating around there.

Justin: Okay, interesting. Is that your best—that's your guess?

Sydnee: Well, I mean, I suppose if you had... I don't know how you would generate such an enormous buildup. And then I also don't know how any—like, you could direct that energy. Certainly not in something you could project a distance from your body, more than I would think, like, a couple millimeters.

Justin: Let me give it to you briefly.

Sydnee: Like when you accidentally shock somebody. When you go down the slide on the playground or you're jumping on the trampoline and you accidentally shock someone, or intentionally.

Justin: Carol Danvers has human DNA that is mixed with her mom's Kree soldier DNA that remained dormant. But there was exposure to psych... [holding back laughter] psychomagnetric waves that stimulated the polynucleotide bonds in her hybrid DNA to activate her latent cosmic abilities. Now, what are psycho... polynucleotide bonds?

Sydnee: They're just talking about all the places where her DNA is stuck together.

Justin: And—

Sydnee: That—I mean, and, like, that—activating those bonds, that doesn't mean anything.

Justin: That allows Captain Marvel to absorb ambient photons in the atmosphere and re-channel them, which allows her to fly around and shoot beams out her hands.

Sydnee: So this is not static—these are photons. These are particles of light.

Justin: Yeah. She d—she uses particles of light. So that one I'm gonna give you—

Sydnee: So I was wrong. [laughs]

Justin: I'm gonna give you a pretty big... F on that. Now, do you—do—

Sydnee: Now to be fair, I was trying to build off of something that was... real.

Justin: So was I, yeah. It's a real book. It's right in front of me. Now, I was about to give you a question about the Vision, and that doesn't seem fair, 'cause he's all machine, baby!

Sydnee: Yeah.

Justin: Unless you believe he has a soul. So let's talk about Angel. What do you know about Angel, Syd?

Sydnee: Angel... Dumott... Schunard? From Rent?

Justin: No. And before you say it, not the broody vampire Angel. Not that either.

Sydnee: Not that one either.

Justin: No. We're talking about Angel, the X-Man Angel.

Sydnee: I didn't know there was an X-Man called Angel. I've seen some X-Man films.

Justin: Okay. And you didn't see—I think he's Archangel later. Here's the spoiler. Like, I'm not really super deep into this stuff either. Like, my dad knows a lot more about this stuff than I do. I'm more of a sporto, honestly.

Sydnee: The last—the last X-Man film I believe I saw is the one where they sort of—like, Jean Grey dies and they kind of allude to the idea that the Phoenix or whatever is coming, but then I never saw any movies after that, so I don't know what happens... after that.

Justin: Okay. So, um—

Sydnee: Wolverine is around. [laughs quietly]

Justin: This is actually a great one. 'Cause Angel—the... as near as I can tell, Angel's big thing is he does fly with these big, beautiful wings. Okay?

Sydnee: So he has wings.

Justin: Big, beautiful wings that he uses to fly around.

Sydnee: I mean, is that it? Is that his whole thing? Like, I mean, that's good. I'm not, like, minimizing the idea of, like—like, having wings.

Justin: Like, you'd like to have wings.

Sydnee: Yeah, I would love to have wings. I think that'd be great.

Justin: Yeah. It'd be sweet.

Sydnee: But is that—I mean, does he have any other...

Justin: Uh, good hearing. [wheezes loudly]

Sydnee: Nuh-uh.

Justin: No, healing! I misread. [laughs]

Sydnee: [through laughter] Oh, okay. I was gonna say, that's—[laughs]

Justin: What an awkward combo that would be. He soars above the sky far away so he can't hear anything, but if he was on the ground he would be hearing like wild. Like, really—no. He has—

Sydnee: He can heal himself or others?

Justin: No, himself.

Sydnee: Oh.

Justin: Himself.

Sydnee: I find that a very disappointing power. Now, if you could use it to heal others, that's intriguing to me.

Justin: Oh, here she goes. Okay, Sydnee. Alright. We get it.

Sydnee: I'm just saying if he's called Angel...

Justin: You already have the power to heal.

Sydnee: Well... yes.

Justin: [crosstalk]

Sydnee: But I was not born with it. [laughs quietly]

Justin: So here's what I want to talk to you about. Angel can fly, okay?

Sydnee: Okay.

Justin: But Angel is a mutant, which you—uh—is—uh—that—

Sydnee: I understand the concept of X-Man is that... X-Men? X-People? Why are they men?

Justin: Thank you. X-Factor. That's the one with Simon Cowell. Go on.

Sydnee: [laughs] The concept is that, like, these are just natural consequences of evolution, right?

Justin: Yes. They are the next—the are homo superior, the next state in human evolution.

Sydnee: So this is just what would happen. We just keep evolving and, like, in theory...

Justin: Yes.

Sydnee: A guy with [through laughter] great hearing and wings—or maybe healing.

Justin: [simultaneously] Healing! Yeah.

Sydnee: And wings. Except for there's the thing where Wolverine's claws were put into him or something, right? Like, there's other stuff though, right?

Justin: So here's what I want.

Sydnee: Okay. [laughs quietly]

Justin: Angel has—because this is a biological adaptation, Angel has biological adaptations that he's had to have to make this incredible flight possible.

Sydnee: Okay.

Justin: I'm looking at four different adaptations.

Sydnee: Sure.

Justin: So, talk to me about what you think some of the adap—the—the mutagenetic...

Sydnee: Well, I mean, he grew wings.

Justin: Wings surprisingly ain't part of it. I mean, wings is part of it, right?

Sydnee: Yeah, like, wings must be part of it. I... I'm assuming it has something to do with, like...

Justin: Four different things. It's not "it."

Sydnee: [sighs] Okay. Well, one would have to do with oxygen, and your ability to breathe in different environments, depending on how high he can fly.

Justin: Stop right there. The [sounding it out] alveoli...

Sydnee: Mm-hmm. Little grapelike clusters of air sacs in the lungs.

Justin: ... in Angel's lungs optimize oxygen intake, allowing him to soar at high speeds and elevations!

Sydnee: Hmm.

Justin: So you were right about that one! Good job!

Sydnee: Yeah, I figured there'd be something there.

Justin: Okay. What else? The oxygen you got. That's stone cold.

Sydnee: Um... is temperature part of it?

Justin: Well... possi—yes, yes.

Sydnee: 'Cause it's cold up there. It's really—it gets really cold up there.

Justin: Angel's muscle mass is considerably more dense than other humans of his size, and any presence of fatty tissue is negligible. So I guess that's not a—the—

Sydnee: No, that would be bad.

Justin: No, you'd need the chub. Trust me, folks.

Sydnee: I mean, to support flying, you would have to have a different musculature, right? 'Cause, like, he has to not—I mean, and the wings aren't enough to life. Like, the whole body has to—otherwise he would just sort of hang in the air by his wings.

Justin: Mm-hmm.

Sydnee: So—you know? Like, you would have to have a different musculature so that you could, like... I'm assuming he flies flat out. He doesn't just, like, hang there.

Justin: No. I mean, I bet he could if he really focused on it, but I bet it's not easy, you know? With the wings.

Sydnee: Right. Yeah.

Justin: I'm gonna—

Sydnee: What about vision? Is his eyesight improved? Since he has—like, if he flies fast...

Justin: The pecten oculi, a comb-like configuration of blood vessels within the vitreous body of the avian eye, is known to enhance sight in some specimens. So he's got one of them. I guess.

Sydnee: One?

Justin: I mean, let's hope—let's hope for—let's hope for—let's hope for two.

Sydnee: [simultaneously] Is it a brain thing or is it an eye thing?

Justin: Let's hope for two, what with the two eyeballs. Let's hope for two.

Sydnee: Okay.

Justin: Okay, Sydnee. One more. This one's right out there.

Sydnee: Um... he doesn't poop?

Justin: He doesn't poop.

Sydnee: [laughs]

Justin: That's on the sheet in big letters. I wrote that in marker. He doesn't poop. No. Think... think Emily Mortimer on 30 Rock.

[pause]

Justin: Jack's girlfriend for a time?

Sydnee: She had the avian bone thing?

Justin: He has avian bones!

Sydnee: So his bones are really brittle?

Justin: Well, probably not brittle. But—[wheeze-laugh]

Sydnee: [laughs]

Justin: [coughs] That would be a weird—

Sydnee: The made-up thing on 30 Rock is that she had brittle bones.

Justin: So he had—a cross-section of one of Angel's bones—and I can show you this picture now, because you guessed all these—the cross-section

shows his hollow inner structure, which reduces his weight for greater flight performance.

Sydnee: Ohhh.

Justin: So it's hollow inside. I guess he don't got no marrow. We need that, don't we?

Sydnee: I was gonna say, yeah. How does he generate new blood cells?

Justin: Um... [pause] probably from the not pooping. Maybe he turns the poop into blood cells.

[pause]

Sydnee: I don't think him not pooping is part of it. I think you made that up.

Justin: Sydnee, um, I want you—can—I'm gonna get a new character up for you. Can you tell us about some of the gifts that people can expect to get if they join Maximum Fun during this special time of year?

Sydnee: I will tell everybody, there's a lot we could just—if you pick any more X-Mans, X-Mens, X-Peoples...

Justin: Uh-huh.

Sydnee: X-Whatevers. There's a lot you could say about their concept of the way evolution works, but just—that's a side not.

Justin: Okay.

Sydnee: Okay.

Justin: Great.

Sydnee: So, first of all, Justin, as you mentioned, there are gifts right now if you upgrade your membership to Maximum Fun, if you join Maximum Fun.

This is the time, because at each level we give you something different. At \$5 a month, you get over 500 hours of bonus content.

Justin: 500 hours! Are you kidding me?!

Sydnee: No. Every show on the network every year, different bonus episode. And it's all there. Not just this year's, not just last year's, not next year's yet 'cause we haven't made it yet, but it will get there. That's just at \$5. At \$10 you get the bonus content, so you get the level before that plus you get 37 reusable stickers and a letterpress Max Fun membership card. Our artist, Olivia Fields, illustrated 37 gorgeous restickable stickers that represent every show on the network, so you can choose your favorite!

Um, these high quality, low commitment stickers—you can stick 'em and unstick 'em which is great, I know, especially in our family. Our kids love stickers and they want to put 'em on everything, and I love stickers and I want to put 'em on everything. And, you know, you take all this time to cover your laptop or whatever with stickers, and then maybe you gotta get a new one eventually and what do you do?

So they're scratch proof, they're waterproof, they're UV protected for outdoor use, and of course you get your own letterpress Max Fun membership card.

At \$20 a month you get everything I've already mentioned plus the Max Fun culinary kit, which is a kit that includes the Max Fun Family Cookbook, designed by Tom Deja, and features recipes from all your favorite Max Fun shows, including Justin. You have a recipe in there, don't you?

Justin: Yeah, I got a couple. I got our chili recipe that we did. Um, there's our French onion soup recipe in there, it's fantastic.

Sydnee: And a jar of bespoke Maximum Fun flavor spice blend. And then of course if you're not—if cooking isn't your thing, if you don't want a culinary kit, you can opt for the ecofriendly cap with an adjustable cap with the Max Fun Drive rocket logo embroidered right there on it. And there are other levels, 35, 50, and above, that have other prizes associated with 'em, but that's just a taste...

Justin: Ooh.

Sydnee: ... of what you can get.

Justin: Just a taste, eh?

Sydnee: If you join or upgrade now.

Justin: Well, that is fantastic, Syd.

Sydnee: And what's that website where you can do that again, Justin?

Justin: That's Maximumfun.org/join!

Sydnee: That's right.

Justin: Get on it. Don't wait. This is your moment. Let's get it down. I got a quickie for you, Syd. Um...

Sydnee: I saw you giggling.

Justin: Yeah. 'Cause the random number generator did give me Spider-Ham. So I just really want to very quickly...

Sydnee: Oh no. Now we're getting into veterinary medicine and fictional creatures?

Justin: How do—no. This is more of a trivia thing, but I did—we all know how Spider-Man became Spider-Man.

Sydnee: Yeah. He got bitten by a spider.

Justin: Yeah. How did Spider-Ham become Spider-Ham? This is a biological question.

Sydnee: I mean, I—I feel like a pig got bitten by a spider is the obvious answer here.

Justin: Is that your final answer?

Sydnee: I—I—

Justin: Think! It's Spider-Ham. He's really zany. He's so zany. He's John Mulaney. He's Spider-Ham.

Sydnee: But it's not a pig that got bitten by a spider?

Justin: It's not a pig that got bitten by a spider.

Sydnee: Is it a...

Justin: [whispering] Say it. [speaking] Don't think about it. Just say it.

Sydnee: A spider that got bitten by a pig?

Justin: Yes! Yes!

Sydnee: No it's not.

Justin: Spider-Ham was a spider that got [through laughter] bitten by a radioactive pig!

Sydnee: [laughs] I don't even think—like, pigs don't—they probably don't bite spiders. They probably just, like, eat 'em.

Justin: Um, okay. I'm—I did want to get into Spider-Man. Friend of the show. [laughs quietly] Uh—

Sydnee: But no, no, no. Wait, wait, wait, wait, wait.

Justin: Yeah.

Sydnee: Spider-Ham is not a spider that got bitten by a pig.

Justin: Spider-Ham is a spider that got bitten by a radioactive pig.

Sydnee: No it's not.

Justin: Yeah!

Sydnee: No, you're—for real?

Justin: For real.

Sydnee: For real, though?

Justin: For real. That's Spider-Ham's deal. Peter Porker. [wheeze-laughs]

Sydnee: Okay.

Justin: [slaps desk?]

Sydnee: Moving on. I will not—

Justin: [strained, high pitched] That's his name! It's his Christian name!

Sydnee: [simultaneously] —entertain this. Yeah, no, I—I understand. I understand. His Chr...

Justin: His Christian name

Sydnee: We are we assuming... any religious affiliation for this?

Justin: Yeah, that's right. He's a bespo—he's a—he's a, uh, an outspoken atheist.

Sydnee: [laughs]

Justin: [laughs] Okay. Let's talk about our friend, Spider-Man. You love him, I love him, friend of the show.

Sydnee: Yeah. Who doesn't?

Justin: Who doesn't love this great spider? You know Spider-Man's abilities, but what I'd love to hear from you is, how's he do it, you know? What are some of the adaptations that Spider-Man has had to make in his body to get some of his incredible abilities? Let's start with some of his more basic ones, the swinging and punching.

Sydnee: Well, the—my... okay. So the way that it looks in the, like, movie representations—and I don't—I have not read... I don't know if I've read any comic books.

Justin: Ever?

Sydnee: Well, no, I've read every Archie ever written. But I don't know if I've read... Spider-Man comics. Like, I never—I mean, I'm sure I have perused one or something. But in terms of my understanding of what happens when Peter Parker gets—

Justin: I used to be into Straczynski's run on Amazing Spider-Man, but that's all I've ever read. [crosstalk]

Sydnee: I think maybe I read some of that too. But I don't remember. Anyway, my point is... so the spider bites him, and it's like a ra—it's like a special spider. Because they're doing... experiments.

Justin: It's a chosen—a blessed spider.

Sydnee: Well, it's not just that. Like, they're doing stuff to it in the lab, so they have done things to the spider to make it a special spider.

Justin: Is the word radioactive gonna come up at some point? Because that is...

Sydnee: Is that—but is that all they did? They just exposed it to radiation?

Justin: Uh-huh. It's a radioactive spider.

Sydnee: Okay.

Justin: Now, some—now, in some tellings of the story the spiders themselves have been sort of... whatever-ed to make it possible for them—like, they've already been, like, tweaking with it, and then they got hit by the radioactive beam.

Sydnee: That's what I mean. It looks like in the movie, that's what it looks like is that the spiders intentionally are being exposed.

Justin: [crosstalk] In the movie. Like, when you say "The movie... "

Sydnee: [laughs]

Justin: Can you... can you possibly drill that? Like, *the* movie?

Sydnee: I'm remembering from the first Toby MacGuire one that I saw.

Justin: Sure, okay.

Sydnee: When he gets bitten.

Justin: Cider House Rules.

Sydnee: [laughs] So, it looked—I feel like they try to give you the impression that somehow the spider is doing, like, gene therapy. Like, that we're actually introducing DNA into Peter Parker's cells.

Justin: Okay.

Sydnee: And, like, his DNA is combining with spider DNA.

Justin: Yeah.

Sydnee: Right?

Justin: Yeah.

Sydnee: Like, that is the impression they're giving us?

Justin: Yes, for sure.

Sydnee: Which is, I would say that the idea that the spider does this is problematic at best, but we'll allow for... that.

Justin: It is problematic. What happened to consent? Like, just ask if you're gonna bite somebody.

Sydnee: Well, like, I mean, I wish—like, if we could just give somebody—if we could change somebody's entire DNA just by having them, like, bitten by a spider...

Justin: You didn't have this problem with Carol Danvers and her Kree mother. Hmm, interesting.

Sydnee: Well, I mean, I feel like that with that we're dealing with an alien species that I do not have any proof exists currently. I'm not saying they don't, I'm just saying as far as we know they do, right?

Justin: [simultaneously] We wouldn't have heard about it if the Kree existed. Yeah.

Sydnee: And with, like, the idea of gene therapy, the idea of, like, trying to change someone's DNA medically is not... I mean, we... we are trying to figure that out, right? Like, we are working on that.

Justin: This is—just like you're stalling to keep from telling me how Spider-Man be so strong.

Sydnee: Okay. So, because he his DNA is now combined with a spider's DNA, he adapts properties of a spider. So, like...

Justin: You're just saying—you're rephrasing the sentence. I want to know how he's so strong. Like, what biologically has changed in Spider-Man to make him so strong and able to spin and swing around?

Sydnee: His... muscles are stronger?

Justin: His muscles are tightly layered, increasing his strength without adding additional bulk to his frame.

Sydnee: Right. Lean. He's lean and tough.

Justin: Yes. That's the strength. But what about the—[holding back laughter]—you know.

Sydnee: He can move quickly.

Justin: Quickly, but also, like, the flexibility. I mean, he's bending.

Sydnee: Right.

Justin: Whoa, he's bending all around.

Sydnee: Right. So does he get more joints.

Justin: Ew, gross, no!

Sydnee: [laughs]

Justin: Elevated level of highly elasticized sinew is present in Spider-Man's musculature. Is that anything?

Sydnee: Well, I mean, you would still need another joint your something in there. Or something—something has to happen to the joints to give them more laxity in a way that is also, like—like, laxity so that they move more, but then can spring back into place without causing damage.

Justin: Mm-hmm.

Sydnee: Which is more than just, like, the muscle fibers.

Justin: Um, do you know, uh, about how his spider sense works?

[pause]

Sydnee: Mm—I mean, they make it look like it's magical.

Justin: Hmm, some debate about that. Actually, here. It is undetermined if the neural activity generated by his spider sense is precognitive in nature, or merely a heightened response to subtle environmental changes. Hmm.

Sydnee: So he can sense, like, temperature, and pressure, and smell, and... things like that that we can't necessarily... sense?

Justin: Yes, but how? Low-grade multidirectional pulses of neuroelectrical current in his brain give him a tingling sensation, which is the spidey sense that we've come to know.

Sydnee: Right. Yeah, it's just brain activity. That's what they're saying.

Justin: Now, this is the worst thing. How he climb on walls? Hmm.

Sydnee: They make it look like he gets little hair-like projections that come out of his fingers, and I'm assuming his feet, and that make him sticky.

Justin: Um... so, we don't exactly know this. There are several hypotheses. One is—

Sydnee: It's not like surface tension, like with geckos and stuff.

Justin: One is that there are... can you pronounce this word for me? S-E-T-A-E? Setae? Setee? Setae? I don't know.

Sydnee: Setae?

Justin: Little ha—little hair-like things on his hands and feet that let him cling to surfaces. That is one. But they could get—and that could get through the fabric of his costume.

Sydnee: Right.

Justin: Okay. Um... an alternate hypothesis, it could be that Spider-Man is able to consciously control the interatomic attraction between molecular

boundary layers. In other words, it's possible he creates a bond between his body's bioelectrical aura and a targeted surface on a subatomic level, granting him the ability to walk on walls.

Sydnee: This means no—this is nothing. This is nothing.

Justin: Hmm.

Sydnee: Mm-hmm.

Justin: Two contrasting theories here. You have to—I guess Sydnee thinks it's the hair-like thing. Thank you, Dr. McElroy for your part of that. I do wish you would more thoroughly consider the oppositions, uhhhh... you know, just 'cause it's outside of your field doesn't mean it's nothing.

Sydnee: If it's the hair-like thing, I think the costume is the most impressive part of that. That it can, like, withstand all the tiny little holes being poked in it, and then immediately, like, it's a sort of adaptable fabric.

Justin: Good costume, no argument there.

Sydnee: You didn't talk about whether or not he shoots silk out of his wrists.

Justin: Uh, I mean, according to this book, this book takes a hard line that the web shooters are mechanical. So I didn't want to talk to you about those, because it's a mechanical invention.

Sydnee: I said silk, which is like a silkworm. I didn't really mean that. I meant webs.

Justin: Y'know. They're silk-like.

Sydnee: Yeah.

Justin: There's some—there's some [crosstalk].

Sydnee: I think—I think that the idea that he actually would shoot them out of his body would be a lot harder to...

Justin: Think about?

Sydnee: In many ways.

Justin: To deal with? To exist with in the world?

Sydnee: Yeah.

Justin: Yeah, agreed.

Sydnee: I think—although the web shooters stress me out.

Justin: The websh—why do the web shooters stress you out?

Sydnee: Because they could run out at any time.

Justin: Sydnee, uh, talk to me about... the Max Fun Drive. If I go to Maximumfun.org/join and I pledge 5, 10, \$20 a month, what is my money going to?

Sydnee: Your money is going in part directly to the shows you love. Um, that's one wonderful thing about Maximum Fun.

Justin: The majority.

Sydnee: Yes, the majority of the money you are donating goes directly to the creators that make the shows that you listen to. You get to choose the shows you listen to, the shows that you want to support and want to keep existing and making more and making better shows for you to enjoy. Um, part of the money goes to Maximum Fun, our network, to support all of our artistic endeavors and to keep us running. Uh, but the majority of money that you can donate when you become a member and join Maximum Fun goes directly to the creators that... I was gonna say "love," but maybe that's too much. That you enjoy. That you appreciate?

Justin: If you've been listening to our shows and you haven't been able to be involved, maybe your financial situation has changed, maybe you started listening to some new shows, whatever, you can start a new membership for just 5 bucks a month, and you're gonna get access to lots of bonus content. I mean, we've got tons of episodes of Sawbones on there that you've never heard before. There's videos, all the shows on the network putting up stuff on there.

And if you can do \$10 a month, we've got those reusable stickers designed by Olivia Fields, which are beautiful. And the culinary kit at \$20 a month that has the spice blend and the Max Fun family cookbook. But real thing you're doing is supporting great stuff. And we really—we are only able to make these shows and spend as much time and energy on 'em as we do because you are so kind to support us. It really means a lot.

Sydnee: We really appreciate it. We've been able to do more and upgrade the sound and the quality of what we can put out to you, to spend more time on researching and creating better shows, we hope. So it really—it goes directly to help us make the stuff that we think you like.

Justin: Um, now, speaking of stuff I think you'll like, Sydnee, Maximumfun.org/join is that address, by the way. Please take a moment and go there. Oh, we've got a whole podcast on there. Justin and Syd—Fast and Furious and Justin and Sydnee.

Sydnee: Oh, that's right. On the bonus content.

Justin: On the bonus content we've got our Fast and Furious, uh... exploration, meditation on Fast and Furious. Okay.

Sydnee: Mm-hmm. It's about family.

Justin: It's about family, really. Um, okay. Our last selection for today, Sydnee, in this series. And please let us know if you enjoy this wonderful series, 'cause I'd love to keep quizzing my wife about fantasy biology.

Sydnee: I don't even think—I don't think this is the only book like this that your dad has gotten me.

Justin: Probably.

Sydnee: I think I have other, like, fictional universe anatomy science books.

Justin: Yeah. If you've got one, PO Box 54, Huntington, West Virginia, 25706. Send it our way.

Um, we're gonna talk about the Hulk.

Sydnee: Oh, okay!

Justin: The Hulk! You know him?

Sydnee: Yeah. The green guy.

Justin: The green guy, yes. We know the Hulk smash. Right? But how he smash? He starts out like a nerd, like you. But then he becomes the Hulk, right? Like me.

Sydnee: Yeah.

Justin: And so—[laughs]

Sydnee: Hmm... hmm...

Justin: [through laughter] Just of the options here.

Sydnee: Well...

Justin: He's all smart and stuff, and then he gets all, like, beefy and [crosstalk].

Sydnee: Yeah, but you wouldn't like him when he's angry.

Justin: You wouldn't like him when he's angry. Let's speak on that. I want you to walk me through the transfor—I have a transformational path here.

Sydnee: [sighs] Okay.

Justin: How he goes from being a sort of nerdy wimp, like some people, and then a big beefcake, like others.

Sydnee: Right. Uh, I—okay. I don't know that I could come up with a plausible... like, actual—I mean, 'cause this—this is a physical change.

Justin: It's a series of reaction.

Sydnee: Well, yeah, but like, this is a—like, his body increases in size.

Justin: You're getting way ahead of yourself. You already know how it starts 'cause you just told me.

Sydnee: Right, he gets angry.

Justin: Okay. So what is that—speak on that.

Sydnee: So he gets angry... and... I mean, I guess what we're talking about is, like, a sympathetic nervous system reaction, like a fight or flight sort of reaction that starts happening with...

Justin: Correct. Anger and fear are interpreted by the amygdala. I don't know if you knew that.

Sydnee: Mm-hmm, yes.

Justin: Which then stimulates the hypothalamus, it says here, to actuate hormone release from the pituitary and adrenal glands.

Sydnee: Mm-hmm.

Justin: Right? So you're crushing that.

Sydnee: Right, yeah. No, I understand all this.

Justin: So what happens in those adrenal glands?

Sydnee: So you're gonna get some adrenaline, some epinephrine is gonna be released, which is gonna stimulate blood flow, and pupillary size. It has digestive tract effects.

Justin: Yeah, he immediately poops his pants every time he turns—

Sydnee: No, opposite, opposite.

Justin: [holding back laughter] He immediately gets constipated?

Sydnee: [laughs] No.

Justin: Is that better?

Sydnee: No, you need the parasympathetic nervous system to do all that. No. Like, all the stuff that happens when you're about ready to fight somebody, you know? Your heart rate goes up. Your breathing quickens. You get more blood flow to your muscles so if you need to, like, run or punch or jump or whatever.

Justin: So the adrenal glands secrete elevated levels of gamma-infused adrenaline into Banner's heart, to be distributed throughout his body.

Sydnee: Okay, see, this gamma-infused is where things start to go off the rails.

Justin: Well, yeah, there had to be something, Sydnee!

Sydnee: Right, because he creates... he creates matter!

Justin: Right. He doesn't actually... cr—

Sydnee: Matter is created. When you watch the Hulk transform, he gets bigger. Where does that mass—where is that matter coming from?

Justin: Well, gamma proteins activate in the bloodstream and are dispersed to cells throughout Banner's body, initiating transmutation. [pause] Seems, I mean...

Sydnee: But that's not something that can happen and un-happen, and it doesn't happen that—so—okay. In order for this to make any sort of scientific sense, he is not creating matter. All structures are just being enlarged.

Justin: Gamma protein—

Sydnee: And so, like, each skin cell has to get bigger as opposed to more to stretch over the increased muscle mass and increased bone density. His head gets bigger.

Justin: You're getting this! Gamma proteins bond with cells and change their hue. Muscle fibers rapidly expand.

Sydnee: The just means they make him green, hon'. [laughs]

Justin: Muscle fibers rapidly expand, drawing additional mass from... [pause] an extra dimensional source! I mean, it's right there! I mean, it's—

Sydnee: [disappointed] Ohhh, g—okay. That's not...

Justin: You just gotta draw from an extra dimensional source!

Sydnee: That's not fair. So... no.

Justin: [wheezy laughter]

Sydnee: See, if they wanted it to make biological sense, you'd just have to say each individual structure—still, if it gets bigger, if it increase in size, it has to be filled with something. Air, fluid... or—or actual matter, or particles of matter.

Justin: What if he was filled with fluid? What if he was just a big water bed of a man just squishing around?

Sydnee: What if he was—[laughs] that's what I imagine that the Hulk is. Like, that each step is a squish.

Justin: [simultaneously] "[Hulk voice] Hulk squish!"

Sydnee: Squish, squish.

Justin: [simultaneously] Squish, squish.

Sydnee: I like the Hulk best when he's smart and strong.

Justin: Oh yeah.

Sydnee: You know?

Justin: Yeah. Absolutely. We all—

Sydnee: That's, like...

Justin: Oh, hey.

Sydnee: Hey, that's—

Justin: And a little bit—look like Mark Ruffalo? Yeah!

Sydnee: Mm-hmm, yeah! I like all that.

Justin: Hey, thanks so much for listening. One last plug: Maximumfun.org/join. We only do this once a year and it really—it makes the whole thing possible. If you like our shows, if you like the work we do, if you think that the stuff we do on Sawbones is important, like putting—like, not this episode, obviously. But a lot of the episodes.

Sydnee: [laughs]

Justin: Are—are worthwhile and important. Please show that with your support. Really appreciate it. We have the gifts, but the main thing is just

helping us keep making stuff. That is gonna do it for us for this week. Thanks to The Taxpayers for the use of their song, Medicines, as the intro and outro of our program. And thanks to you for listening. That's gonna do it for us this week. And until next time, my name is Justin McElroy.

Sydnee: I'm Sydnee McElroy.

Justin: And as always, don't drill a hole in your head!

[theme music plays]

[chord]

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