

Sawbones: Superman

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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.

["Medicines" by The Taxpayers plays]

Justin: Hello, everybody, and welcome to Sawbones! It's a podcast. It's a bird. It's a podcast. It's Sawbones. Hi, I'm your co-host, Justin McElroy.

Sydnee: And I'm Sydnee McElroy.

Justin: I'm so excited, Syd.

Sydnee: I know you're excited. I appreciate that you're excited. It's helping... It's helping me recover from my sadness.

Justin: Do you want to tell everybody what happened while I prepare for this? This is a marital tour of misguided medicine. We're the co-hosts of it. And usually what happens on the show is that Sydnee researches a topic for medical history and—

Sydnee: Which I did do.

Justin: Did do.

Sydnee: Here's the problem.

Justin: Can't say you didn't do it.

Sydnee: We've been doing the show for 11...

Justin: Yeah, 11.

Sydnee: 11 years. 11 years now we've been doing this show. That's a lot of episodes. I don't know how many, but you probably do, because it's probably listed in the—

Justin: It's a lot.

Sydnee: It's probably like next to the episode, right? Like you can see—

Justin: Wonka was 500. Wonka was our 500.

Sydnee: So over 500. And in that time, you forget things sometimes, like maybe that you've done an episode before. And maybe because it—from my perspective, I know a lot of this stuff already. Not the history, like I'm researching the history, I don't know all of medical history.

Justin: Yeah.

Sydnee: But like the medicine part, I know. And so it doesn't occur to me, oh, I've talked about this before because I knew it. I don't know. Anyway, I researched the spleen.

Justin: And we made it a good six minutes in.

Sydnee: Oh, honey, we were 15 minutes in.

Justin: Yeah, it was deep. It was deep before—

Sydnee: Before Justin said, "I think I've heard this before." And then we realized we have indeed done an episode on the spleen before. I don't know how I forgot that! I don't know how I forgot that...

Justin: You got a lot going on, toots. But let me tell you, Syd, you don't need to worry, because I am here to educate you for a change. Even though you probably know a lot of the stuff that I'm probably going to tell you anyway. But I would like to mark this—take this opportunity of having an episode where we don't have something to talk about. I would like to fill that gap by talking to you about the last son of Krypton, Kal-El, Superman. Specifically, Superman from a medical perspective.

Sydnee: Okay.

Justin: I have a text here, a tomb. Many remember my Anatomy of the Marvel Universe textbook.

Sydnee: Uh-huh.

Justin: This is the—

Sydnee: Textbook?

Justin: This is my—yes, Sydnee.

Sydnee: Textbook?

Justin: As you can—if you look at it, it's quite clearly a textbook.

Sydnee: Okay, what is the formal definition of textbook?

Justin: A book with text that is about truth and teaches you things, and is a store of knowledge for future generations. This is Anatomy of a Metahuman. It is the same idea, where it's talking about the medical science. So we can finally get over this 'prove it' stuff. And it's the medical science.

Sydnee: The medical science—

Justin: Of metahumans.

Sydnee: I'm gonna say, I think you can call it a textbook. Because this definition I just Googled very quickly is: a book containing a comprehensive compilation of content in a branch of study with the intention of explaining it. It doesn't say it has to be real.

Justin: Yeah, that's true. I mean, that's—

Sydnee: I mean, I think you can—a branch of study could be—

Justin: Branch of study is a little bit, I mean, yeah. I mean, you're right, this is a textbook. Thank you, Sydnee, for the re... reaffirming that.

Sydnee: So I guess it's a textbook. I mean, I guess, unless—

Justin: It is a textbook.

Sydnee: Yeah, and a study of a subject, your subject is Superman. And that textbook is telling you about Superman. So I guess—

Justin: So on the front, it says it was written by S.D. Perry and Matthew K. Manning. On the inside, it's written by Batman. So, I'm pretty sure it's written by Batman. Because everything's from sort of Batman's perspective. But this is a whole book about metahumans, and I'm definitely gonna dive into the whole thing. But I realized like there's enough right here, just in Superman, the original superhero, to talk about.

Sydnee: Okay.

Justin: Do you have something that strikes you as funny, Sydnee?

Sydnee: That Batman wrote the book is funny. I didn't think—

Justin: Why wouldn't Batman write the book?

Sydnee: Well, you know more about Batman than I do.

Justin: Uh-huh.

Sydnee: And I know that he's a detective.

Justin: Yeah.

Sydnee: Like, that's part of the Batman thing. And I mean, there's the bat thing too.

Justin: It's a huge part of it.

Sydnee: And I know he's got a lot of like gadgets and stuff.

Justin: Yeah, 100%.

Sydnee: Yeah.

Justin: Yeah.

Sydnee: I didn't know that researching and creating textbooks—

Justin: Okay, you will actually—

Sydnee: Like that feels slightly different than, "I made a Batarang."

Justin: Batman has had his optical problems, but I think that we can—not like literal optical problems, because he's got like a variety of bat suits with incredible hyper optic technology. I'm saying there are some issues with the way he approaches himself, being a rich, white dude, and how he fights crime or what have you. I will say, I think we can all celebrate the part of Batman's brain who's like, "I'm gonna keep a file on how to kill Superman." [titters]

Sydnee: Well—

Justin: "I am gonna be the one—everybody's so up with Superman and like, yes, absolutely Superman. But one of us has to think about how to kill Superman, and I will be that guy."

Sydnee: Is that, is this, outside of this textbook—[titters] I'm gonna keep calling it that—that you're holding—

Justin: This is a textbook about how Batman would kill everybody. [chuckles]

Sydnee: Right, but outside of this textbook, is that canon, that Batman—

Justin: Canonically.

Sydnee: So there are other like comics or movies or—

Justin: Batman has beaten—

Sydnee: Something where—no, no, no, where Batman has collected information into a reference file, so that he can kill metahumans.

Justin: Yes.

Sydnee: This is a thing Batman does

Justin: This is known. This is not made up.

Sydnee: Okay, that's all I was trying to figure out. I didn't know that.

Justin: Yeah, Batman—not like so he can hunt them down and kill them, but like, if things pop off.

Sydnee: Maybe, it's Batman. You don't know.

Justin: Yes, Batman does like to be prepared for every eventuality.

Sydnee: Okay, so tell me about metahumans.

Justin: So what do you know about, let's—no, I don't want to talk about metahumans. I want to talk about the number one metahuman in the DC universe, Superman.

Sydnee: Is he a metahuman when he's an alien?

Justin: So, this is an interesting question. As Batman writes, "Superman is a name that is elegant in its simplicity, yet speaks volumes about what he truly is. A god-like power in the guise of a human."

Sydnee: Because he's not a human.

Justin: No, he cannot be the—"Superman can't possibly be the best of us when, in fact, he isn't one of us at all." Batman wrote that. Hm.

Sydnee: Mm-hm.

Justin: Very interesting.

Sydnee: Well, yeah. Well, he's not—so he's an alien. This is gonna make—

Justin: He's a Kryptonian.

Sydnee: Right. This is gonna make it harder to apply my knowledge of human medicine to him, because he is not human.

Justin: That's correct. But we are—what this is—these books are really about is a sort of—and the fun of it is a sort of speculative anatomy.

Sydnee: So let's—

Justin: A speculative science of, okay, you know, this person can do these things. And given the—I want to start with base knowledge where, yeah, Superman—

Sydnee: Okay, but so—and we're gonna assume that Superman, like in terms of basic structure and function of his body, is similar to humans? Kryptonians and humans are fairly—

Justin: You, on—

Sydnee: Like the organs are the same?

Justin: No.

Sydnee: None of that?

Justin: None of that you should assume.

Sydnee: Cool.

Justin: You should assume he looks like a human being, and that's it. And inside him is a dark, swirling morass of powers and—

Sydnee: So he can fly.

Justin: Listen, I have a—can you see I have a list in front of me, Syd?

Sydnee: I thought you wanted to tell me what I knew?

Justin: This is a list of powers. I'm asking you—yes, okay, not about his specific abilities, but about the motivations for his abilities. What do you know about him as a person? Scientifically speaking.

Sydnee: My understanding is that he, I don't—let me say this. I don't know what power—

Justin: I'm not challenging you. This is not a quiz.

Sydnee: I don't know enough about Superman lore to know what powers he had on Krypton.

Justin: No powers.

Sydnee: Okay.

Justin: So this is interesting.

Sydnee: The sun gives him power, right?

Justin: Yes. The sun does give him power.

Sydnee: That is... hm...

Justin: In part.

Sydnee: Oh?

Justin: So we're gonna talk about that.

Sydnee: Okay, that's—I thought he's powerful because he came to Earth, and on Earth, we've got the sun. Well, we don't have the sun here. You know what I mean.

Justin: We do have the sun here, actually.

Sydnee: Well, you know what I mean. Like we don't have it here on—it's not physically on Earth.

Justin: We have a yellow one. That's different from his crappy red one.

Sydnee: There's a sun shining on us, and it's giving him powers. And I guess if he went back to Krypton, he wouldn't have them?

Justin: Right, so this is an excellent starting point for our dialog here. Superman is a Kryptonian, which means he is from the planet Krypton. Which is bathed in a red sun's light, not the yellow sun of here. Now, it does beg the question on how that would impact the visible spectrum of light on Krypton. Does everything look different and weird? The answer that is; we cannot tell you what Superman's vision looks like. It looks different from ours. It has to be. He can see electromagnetic fields, okay? There's no reason to compare these two.

Sydnee: Well, and he has X-ray vision, doesn't he?

Justin: He does not! [chuckles] We'll get to that!

Sydnee: He doesn't?

Justin: Technically speaking, Sydnee...

Sydnee: How does he see through stuff?

Justin: You see technically, he can. But it's not X-ray vision. So let's start at the beginning. What's the problems with researching Superman? Syd, if you were Batman, and you have to do research on Superman, this meta human

research. Even if Superman's willing and able, what do you think some of the challenges might be?

Sydnee: Well—

Justin: Data collection. That's where I want to start with you.

Sydnee: I would want to know about other Kryptonians, or about Kryptonians in general. Anatomy, physiology, that sort of thing.

Justin: Sure, but you have to, see—

Sydnee: But I wouldn't be able to do that, because I'm assuming there's no books about Krypton here on Earth?

Justin: Not that we—I mean... no. And as far as Superman knows, he's just a gushy bag of blood. He has no idea.

Sydnee: So to study Superman, you would need—he would need to allow you to do tests on him. To do, I would imagine, like some imaging studies?

Justin: Okay, first—

Sydnee: Some MRIs.

Justin: First problem. First problem, the Bat Cave's technology is incapable of fully analyzing his alien physiology. Needles won't pierce his skin.

Sydnee: Oh?

Justin: Conventional radiological imaging devices often fail to penetrate his dense musculature. So, there's a few problems just in that.

Sydnee: His muscles are so dense that you can't use a CAT scan?

Justin: I know...

Sydnee: What about the other structures in his—he's not just a solid mass of muscle, I'm assuming?

Justin: There is a—Batman does kick around the possibility that an X-ray machine that uses the radiation from Kryptonite could be an option here. But is that worth the risk to Superman?

Sydnee: Well, wouldn't it kill him?

Justin: Unless he's like swallowed a truck—what?

Sydnee: Wouldn't it kill him?

Justin: We'll get to that. So, the first thing I want to talk about is what you touched on, his solar—his ability to generate his powers from the yellow sun. Batman has some theories about how this happens. And I should explain that Batman, for a lot of this, he's not going to be able to give you hard data, because of this data collection issue. So a lot of what Batman is cooking up is metaphorical or an analog to what we might understand, even if it's not accurate. So like what—taking these—this energy and making it into something he can use.

Sydnee: Well, I guess there's a couple options. If you're comparing him to human physiology, I mean there's—like I guess UV rays help us convert vitamin D to its active form in our body. So there are reactions that take place from being in the sunlight, right? Like from being in the sunlight. And it also has hormonal and chemical influences on our brains, because our circadian rhythms are very much tied to visual light.

Justin: Or as Batman writes, "It seems likely that absorption is normal for Kryptonians, similar to our own ability to synthesize vitamin D from sunlight." So you and Batman are basically in lockstep.

Sydnee: Did he—did Batman consider it all though that maybe it's plant-like?

Justin: Yes. Membranous in appearance, his epitheli... epithelial?

Sydnee: Epithelial.

Justin: "Epithelial cells appear to be unique—"I don't know why I said it like—sills, his epithelial sills—"appear to be unique. Perhaps analogous to a hybrid of animal and plant. While membranous in appearance, they seem to share characteristics with wall plant cells, and are able to photosynthesize and store energy through exposure to sunlight."

Sydnee: That was me—see? That was my next question.

Justin: So it's like a hybrid.

Sydnee: Could photosynthesis be part of it? Because if he is a plant, then using the sun for energy is very—

Justin: Mm-hm.

Sydnee: I mean, that's boring, basically.

Justin: Yes, exactly.

Sydnee: Superman is a plant.

Justin: Superman is in part a plant. Now, what about the fact that he can get hurt so much and not—and be very tough? Batman's got a wild theory for this one, and it's about cytoplasm.

Sydnee: Well, okay, let me ask this question. Is it that he gets hurt and heals quickly? Or is it that things cannot—

Justin: Why he is—he does both.

Sydnee: Like if I tried to stab him, my knife would break.

Justin: Correct. Well... yes, it wouldn't penetrate his skin.

Sydnee: It wouldn't go through his skin.

Justin: Nothing. Almost nothing penetrates Superman's skin.

Sydnee: I mean...

Justin: It used to be that nothing short of—I think when he was created by Siegel and Shuster, it was nothing short of like an exploding cannon shell could penetrate his skin. Or an exploding tank shell.

Sydnee: You just have to generate enough force.

Justin: But now it's, I mean, he's basically indestructible.

Sydnee: Well, then it's not—I mean, my question would be, is like the—when we talk about like human cells, like epithelial cells, like you talk about skin cells, his are not the same. They're not made of that.

Justin: So here's what—

Sydnee: They're made of a different material.

Justin: What Batman suggests is that his epi—in his epithelial tissues, particularly his skin, may be—the cytoplasm in there may be similar to a non-Newtonian fluid. So that his—the cytoplasm is a non-Newtonian fluid. So if you—to the touch, it would feel normal. But if you tried to strike it with any sort of force or energy, it would—

Sydnee: Absorb that.

Justin: Absorb that in the same way that they...

Sydnee: Like when you put... what is it? Cornstarch and water?

Justin: Yeah, exactly.

Sydnee: Like when you make a whatchamacallit, what's that called? You know, Charlie loves to make that.

Justin: Oobleck.

Sydnee: Oobleck, yeah. So he's made of oobleck.

Justin: Yes.

Sydnee: So what you've got for me so far—

Justin: So far—

Sydnee: Is that he's a plant whose skin's made of oobleck.

Justin: Correct, yes. But let's talk about—

Sydnee: I wouldn't have thought that would be—

Justin: His terrible eyes!

Sydnee: I mean, to be fair, this diagram you're showing me of Superman's eye, nobody's eye would look great in that cross section that you have there.

Justin: It is a—

Sydnee: That would be disturbing in any—

Justin: Yes, this is a wild diagram. But I want to talk about you—we talked about visual capabilities a little bit. You mentioned X-ray vision, which I want to get to. But as we can all—well, we don't all know, but at least some people know. Superman can also see it extremely long distances, and he could see at microscopic levels. So he can see way out into space, and then he can use his eyes like a microscope.

Sydnee: I mean, I would say there's—oh, man, eye stuff is rough. For all of my fellow primary care docs out there, you know I'm talking about.

Justin: Yeah, man.

Sydnee: The eye stuff gets rough. I know when the emergencies are happening. Generally speaking though, I would say, one, we're talking about the focusing ability. And so the lens of Superman's eye is capable of doing things that our lens, our human lens, is not. In terms of being able to focus on something that is very far away or very close. But then the other thing would be the light. Like if you're talking about something that's very small, that's like focusing ability. But then if you're talking about something that's very far away in space—

Justin: You have to let more light in, right.

Sydnee: Right, you're not—because there's no light reflecting off of that thing, that's why we can't see it. And so the dilation of the pupil, the convexity and concavity of the lens—

Justin: He's saying—so what Batman—the best Batman can come up with, and I think even Batman knows at this point that this is like not a good solution. He says his eyes must contain multiple lenses of varying thicknesses. So Batman is suggesting that there's a bunch of lenses in there, that Superman is just like adjusting the distance between to adjust his vision. [titters] Now, here's what I'll say though, Syd. After that he says, "To account for this incredible range and accuracy, his eyes should be much larger." So this, I think that's what he's depicting. So like Batman's like, "I've got it all figured out. The only problem is his eyes would need to be like pool balls." [laughs] It would be like the entirety of his head But this is basing—

Sydnee: He'd be like an adorable anime character.

Justin: Yada, yada, this is how Batman thinks Superman's vision was. [chuckles]

Sydnee: I don't think—I mean, what you're dealing with though is like you almost need a mechanism by which the lenses flip in and out. Kind of like they do if you've had an eye exam where they flip the lens.

Justin: Eye exam, right—

Sydnee: Where they flip the lens—

Justin: This is what I imagine inside—

Sydnee: Like one or two?

Justin: Inside the jellies.

Sydnee: Two or three? Like, yeah, you would almost have to have that sort of scenario. Because otherwise, if the light is focusing through all of those lenses and somehow he is using—willing the use of different lenses. Or I guess this would have to be on a subconscious—I mean like this can't be a willful action.

Justin: Yeah. It's all instinctual, that's a key with all the Superman stuff. It's mostly instinctual.

Sydnee: I think it's more likely that the lens can change.

Justin: Oh, change shape or something?

Sydnee: Yeah, change shape and size. I don't see any reason it would migrate forward and backward within the globe. I don't know why would you need multiple lenses if you would imagine that he has adapted the ability to... you know, the lens can adapt to what is needed. I think that makes more sense.

Justin: Yeah, but then you're bumping up against the fact that like where is it retracting and expanding to? Like at a certain point, are you like creating a detracting mass from an object?

Sydnee: No, because I mean if you imagine that his lens is somehow made of some sort of lattice work of cellular tissue that expands and contracts.

Justin: Mm-hm. So he's eliminating the amount of—

Sydnee: Did they ever make you—do you remember when COSI traveled and came to your school and did COSI stuff?

Justin: Yeah.

Sydnee: Did they ever make you cut a piece of paper into a shape that would—like so a bandage would cover an entire wound? Did they ever make you do that thing?

Justin: No.

Sydnee: You cut it into this latticework accordion sort of thing. That's the trick. That's how you take a piece of paper that's not big enough to cover something, and then you cut it into this accordion style thing, and it stretches further. And you can use it to more or less cover the entire area. This is what I'm suggesting about Superman's lenses.

Justin: You suggest—you also mentioned X-ray vision, and that's actually a misnomer. He can't see through stuff, but I'll explain more—

Sydnee: You can tell me more about that—

Justin: Yeah?

Sydnee: After the billing department.

Justin: Let's go.

[theme music plays]

[ad break]

Justin: These poor people have waited long enough to find out how the X-ray vision works.

Sydnee: So he doesn't have it, or he does?

Justin: He doesn't, because he's not irradiating whatever he's looking at. So it's not X-ray vision. X-ray vision is a misnomer. Now, what Batman suggests is that perhaps he can detect particle density patterns, or perceive

the length of radio and sound waves in complex layers and visually observe how they interact and reflect from matter.

Now, Batman does go even out on a wilder limb than that and says, "Muons, the detritus of cosmic rays, may settle to the surface of our planet at something like—or they settle to the surface of our planets in like 10,000 per square meter per second. If Superman were able to sense how these decaying particles interact with matter, the ability might be likened to X-ray vision." Probably not though, Batman. I mean, probably not that, you wild dog. What does that mean?

Sydnee: And there are muons, that's a thing.

Justin: Muons are a thing! But everything else he said was just like, wouldn't it be—isn't it easier at a certain point to just say it's magic, Batman? Just say it's magic, man.

Sydnee: I mean, he would have to—in order to be able to look through someone's skin, which like that is what we are—he can look through a solid object.

Justin: He can, yes. But the muons are interacting with the particles, and he can see the—he has no idea. Batman just has no idea.

Sydnee: I mean, is he using some sort of... but does he—so he also has the like, the... can he shoot lasers or heat?

Justin: Heat vision is what we're going to talk about next.

Sydnee: Can he emit some sort of wave that can interact with the particles of the object he's trying to look through in order to create something that is momentarily and perhaps just for his vision, transparent?

Justin: That's interesting. Maybe the wave that he's—it's almost like an echo location, but he's like making his own electromagnetic pulses.

Sydnee: The way that The Flash moves through things, right?

Justin: Right, yes.

Sydnee: By vibrating at the same frequency that it does? I wonder—

Justin: Yes, yes. Now we're talking.

Sydnee: I wonder if like you could use a beam of... radiant heat?

Justin: So he creates directed beams of radiation, right?

Sydnee: I don't know why you couldn't use that. I mean, I know it's different waveforms, but like...

Justin: There is a wild sentence in here. It says, "Clark says that the energy is solar-based, and I have no reason to doubt him." So it's wild that in this book Batman wrote, didn't just write it's solar-based. He says, "Superman says it's solar-based. But how do I know if Superman is telling me the truth or not? Just so you know, history, he might be lying to me about this."

Sydnee: That sounds like Batman, though.

Justin: He's so paranoid.

Sydnee: That sounds like Batman. I mean, is he suggesting that he is drawing somehow... Oh, this feels like that thing you always say when I'm like, but mass cannot—matter cannot be created or destroyed, and that doesn't make sense. And you're like, well, but they pull it from another dimension.

Justin: Right, yes.

Sydnee: This kind of feels like one of those like—

Justin: You're talking about heat vision at this point.

Sydnee: Yeah, like if—are we suggesting that he is extracting the heat from the sun and then directly funneling it through his eyes? And if so, like what is the conduit? Does he have some sort of—now I mean the other thing is,

does he have some sort of like solar panel in his... head? I don't know, somewhere. Like does he have an exterior solar panel on his body that it's absorbing...

Justin: Is that what the cape is? We've all wondered.

Sydnee: No, because then—no, because I am certain that if you dug back through all of the Superman media that's ever been created, there is some moment where he uses his heat vision without wearing the cape, right?

Justin: Right. Yeah, no, I'm just kidding about the cape.

Sydnee: Well, unless he can store it. Maybe at night he attaches something to himself that's like solar panel-esque, and then stores that energy in his optic nerves?

Justin: Okay, are you ready for this?

Sydnee: Yeah.

Justin: So, Batman talks about that while he studied bats, he saw that bats and other nocturnal mammals have reflective layers of tissue behind their retinas, which allows them to amplify available light. So, think about if you see like your cat sometimes and they look at you in the right way. It's like, whoa, is that like generating light from your eyeballs? Your eyeballs are glowing. And it's like, no, it's just they have this material behind them.

So like what Batman is saying is like, okay, for starters, some animals can do this, so maybe Superman is doing that. And then he imagines that Superman has a variation of this retroreflector made of some sort of semi-solid optical crystalline material. Like a phosphate using laser amplification. It's possible that the vitreous gel acts as a lasing medium.

Sydnee: Hm...

Justin: Hm...

Sydnee: It's possible.

Justin: It's very possible that stored solar energy could be key to the process. So the light builds strength through this reflection amplification that photons would be produced in the trillions. And basically he is like you say. And he's also pointing out that mammals have the capacity for endothermic heat generation.

Sydnee: Yeah.

Justin: So this was just a combination of maybe those two things.

Sydnee: See, I don't know enough about building a laser to know about like what kind of medium, what kind of material.

Justin: Right.

Sydnee: Would the vitreous indeed be an appropriate—do you need a medium to focus a laser? I don't know. I don't know how to build a laser is what I'm telling you. [chuckles]

Justin: Now, at this point in putting together this document, I think Batman was starting to get kind of demoralized about the idea that he might have to fight Superman someday. He just keeps stacking these up. He writes here, this is the page about freeze breath. He says, "As with his heat vision, Superman's freeze breath could also pose a significant threat if he ever chooses to use it offensively."

And then there's another line below that, "A single breath would likely have the same effect on a human being as being immersed in liquid nitrogen. Death would be instantaneous." It's like, wow, it does sound very hard to fight Superman. You're right, Batman.

Sydnee: Can the freeze breath freeze anything? Is it cold enough that it can freeze—

Justin: He has seen—he has seen him freeze thousands of gallons of water. He's frozen entire waves, saving thousands of lives in the process. This is from Batman's own notes.

Sydnee: Is it because it's so cold? Is it just cold? He's just freezing through the power of cold? Or is it like an ice-nine kind of situation?

Justin: So, oh, isn't that interesting? No, he thinks that he might have some sacks of liquid nitrogen or ammonia inside of his lungs, as you can see here. I've got a medical diagram.

Sydnee: Yeah, you've got a medical diagram that has those.

Justin: Can you describe that for the listener? The medical diagram.

Sydnee: So you've got lungs and then—I don't know if this is sitting in front of or behind his heart.

Justin: It's probably both.

Sydnee: Behind, I guess? There's like a little sort of Mickey Mouse head shaped bag.

Justin: A sack.

Sydnee: Sack of—

Justin: This is in the body, it's a sack.

Sydnee: Blue. Which I think is meant to mean cold, because blue—

Justin: Yeah, it's liquid nitrogen.

Sydnee: So it's like liquid nitrogen.

Justin: Or other chemicals.

Sydnee: Right.

Justin: Bio chemicals. [chuckles] Batman is like straight up with you. Like, "I don't know how this works." He's like, "I actually don't know." He's like,

"The Joule-Thomson effect in thermodynamics describes the temperature change of a compressed and insulated gas." So maybe he's like super compressing the air in some way.

Sydnee: Sure.

Justin: Inside of him. And that is what is giving it coldness.

Sydnee: And then—well, but then when he releases it, you'd have to release it in a pretty concentrated stream to actually freeze something, right? Because if it was just sort of emanating from him and dissipating into the atmosphere...

Justin: Yeah.

Sydnee: You know what I mean? Like...

Justin: Now, I have a few more powers to get through. I'm sorry, I gotta speed up a little bit.

Sydnee: All right, speed up. Speed up with your powers.

Justin: I'm just on to strength. So Superman's strength, according to Batman, comfortably estimates that his muscular strength exceeds five sextillion metric tons of force. Which is like, he's just so strong.

Sydnee: Does he have like more fibers?

Justin: "He possess—he may possess an alien network of additional tendons and ligaments that fortifies his muscular strength." 100%. 100%. "Possibly, he has bivalves and trivalves between the atria and the ventricles." More valves.

Sydnee: Oh? Why would you... now, that doesn't—more valves between the—in the heart?

Justin: Yeah, look—

Sydnee: There's not—

Justin: Look at his—look at his heart, man, it's crazy. This is incredible.

Sydnee: I don't know why you would need—like why would more valves move the blood faster? Are we suggesting that we need to get the blood through—then why doesn't he just have an open circulatory system?

Justin: It's more efficient. He's saying it's a more efficient design, so it's more streamlined and it's able to operate better. Because it's more symmetrical.

Sydnee: No...

Justin: Now, this is—

Sydnee: That's not—

Justin: What's weird about—

Sydnee: That—no. Because you don't need the same amount of pressure to pump blood through the lungs. See that heart, what you're suggesting is that—I mean, assuming that his circulatory system works the same as a human's, one side of the heart is pumping the blood through the lungs. The other side of the heart is pumping the blood to the entire body. Which is why that muscle, that side of the muscle, is meatier. Because it's got to pump blood throughout the entire body. You don't want that same sort of pressure entering the circulatory system of the lungs, because you would damage it. And so it is not as strong on that side. But that's by design. Unless we are suggesting that the everything is just heartier?

Justin: Yeah, I mean, he's suggesting—

Sydnee: Everything's made of whatever the skin is made of.

Justin: Everything—he said the connective tissue—

Sydnee: Oobleck.

Justin: Has to be like machine-made carbon fiber or something like that, something that's like diamond hard.

Sydnee: So he's like part mecha something?

Justin: This is—but this is what—this is where Batman really starts to frustrate me. He says, "Muscular strength alone can't explain how the heavy objects that Superman lives don't collapse under their own weight, or how he's able to protect himself from forces like inertia and momentum." So what super—Batman is asking here is like, even if all this stuff is right, if there's a plane falling from the sky, right? And Superman goes over and comes underneath it and catches it. Theoretically, this isn't a good example, but you can understand how he should just go through it, right? Like, if he catches a building, the force, the weight of that building is then pushing on a very small point, which is Superman. So like—

Sydnee: I gotcha. So why doesn't he blast through it?

Justin: He should just blast through it, right?

Sydnee: Hm... I mean you would think, yeah. I mean unless, again, we're referring to the Oobleck nature of his entire body, which can absorb and redistribute that force equally.

Justin: He says that he might—he thinks Superman might project a field of negative mass, effectively negating the weight of objects he encounters. Okay, Batman, just—again, just say you don't know. Just say you have no idea. And then he gets to flight and it's like, well, it may be the thing I said about the negative mass. Obviously, that would explain a lot of it. And if it is the negative mass, that's kind of hysterical. That Superman's like, "I'm lifting this." It's like, you're not. You're just using magic on it.

Sydnee: Yeah, that would be magic at that point. Here's the thing about the flight. If you combine like his muscles are so strong, I assume that's why he can jump high, right? Because he can leap tall buildings.

Justin: Yes.

Sydnee: So he has this like—

Justin: No.

Sydnee: Strength and then some sort of—

Justin: I mean, yes, he could jump. But he also—

Sydnee: Elasticity, the oobleckness, whatever. You combine that with his speed. So he also is super-fast, right?

Justin: Yes, yes.

Sydnee: That alone could account for the flight.

Justin: Yes, but also, he—

Sydnee: He's just got the momentum to—he's got the—he's got the hop—he's got the hops to get up there. And he's got the momentum to stay in the air.

Justin: Right. That's true. He's... one thing that I did want to point out, you're covering all the bases that Batman hit.

Sydnee: I mean, he's just a plane. [titters]

Justin: He's basically like a plane, yes. But he says, in fact, "If he can in fact create and/or interact with magnetic fields, he could conceivably fly sitting or standing." Batman writes that in the book. Like, yeah, Batman, I guess he could fly around in a seated position.

Sydnee: [titters]

Justin: That would look absolutely unhinged. Have you never seen someone fly around, Batman?

Sydnee: I don't think there's any reason to believe he couldn't fly in any position given the speed?

Justin: How quick do we turn on Superman if he starts flying around in the upright, standing position? We're done instantly, right?

Sydnee: Well, I think there is—

Justin: We need him supine or not at all.

Sydnee: When someone—when you see a character in some sort of, you know, whether it's superhero, fantasy, supernatural, something. Horror movies do this. If you see something upright, moving towards you in the air—

Justin: We don't like that.

Sydnee: That's scary.

Justin: That's scary, we don't like it.

Sydnee: That's scary.

Justin: And sitting? Go back to Krypton, that's—

Sydnee: It's menacing.

Justin: Wild!

Sydnee: It's menacing.

Justin: Sitting is not menacing. Sitting is like, this guy has to go. [chuckles]

Sydnee: Well—

Justin: Can't be on this planet anymore.

Sydnee: No, I think it's like why do you have the time? What are you capable of?

Justin: Yeah, why aren't making a better use of this?

Sydnee: No, but I think that the laying down position, the classic Superman flying position, I would assume is just practicality. Like it's best aerodynamically.

Justin: Yeah. Real quick, to move on to our last few. You mentioned—he does have super hearing. And I just... he's really struggling with this one. He writes, "There's a kind of moth that can hear up to 240,000 hertz." Normally we can hear between 20 to 20,000 hertz.

Sydnee: Mm-hm.

Justin: So he's thinking—and that is—that is so the moth can avoid being eaten by echo locating bats. Batman has a lot of knowledge about bats that he like trots out to like see if it connects to Superman.

Sydnee: Well, that makes sense. Batman's always making it all about him.

Justin: He also thinks—now, he—

Sydnee: But what does the—how does the moth's ear work? Is it—what is the—

Justin: Oh, he doesn't say in here. He thinks maybe multiple cochleas.

Sydnee: Multiple—oh.

Justin: Multiple cochleae?

Sydnee: This idea that we just need more of things to make them work. No, it has to do with the size and shape, the like distance between things. Like when it comes to sound and the movement of sound waves, like more cochlea, I don't know why that would make—

Justin: There's also like in this diagram of two cochlea, he's like—it looks very clearly scribbled out in pen. And I did not do that. So it's almost suggested that Batman was like, "No, it's stupid."

Sydnee: It is stupid! That's not—no, it would—I mean like, how thinly stretched is his tympanic membrane? And how—what is the depth of that canal? And like, how sound—I mean, that's what you would talk about. Maybe a more efficiently shaped ear canal? Because like our ears are shaped pretty well for hearing. But obviously—oh, and can his ears move, like a cat's? Because that would help.

Justin: That's not clear, but I feel like it's probably within—if I can almost do that, I feel like Superman should definitely be able to.

Sydnee: I would imagine there—we have a—this is a structural thing. If you look inside his ear with an otoscope, I think you would see a different structure of the ear canal. The bones, the membrane.

Justin: He talks about the super speed brief—and I do want to say he's equally flummoxed by that. You mentioned The Flash earlier, and that's getting in touch with like the Speed Force. But Superman doesn't seem to interact with the Speed Force in any sort of meaningful way that he knows. So, it's probably not the Speed Force.

Sydnee: I mean, if we—are we just talking about the expansion and contraction of—like his muscle fibers fire more quickly than the rest of ours.

Justin: Yes, but it starts to get into this question of like impact on the environment. Like why isn't he destroying things around him with the speed that he is theoretically moving? Now, he does not—there are limits to this. He does not—it says he does not travel the speed of light, because to do that, he would have to convert into energy, which he clearly does not. I would remind Batman that in the '90s, he did momentarily lose his powers and did become energy that was only contained by a special blue suit, during the Superman Blue days.

Sydnee: Well, also, didn't he fly around the Earth backwards once and then turned back time?

Justin: In the Richard Donner film, he did do that. And it is... pretty unhinged, I'll agree.

Sydnee: Well, and that—I mean, none of that makes sense. But like he definitely would have to fly faster than the speed of light to accomplish... Also, you don't need to turn the Earth back around, but whatever. The point is—

Justin: The best Batman comes up with is he repeatedly pierces the fabric of space time, creating wormholes that exist for fractions of nano seconds. Batman, just say you don't know. Just say, "He's so fast and I have no idea how he does it."

Sydnee: He's winnowing.

Justin: He's winnowing, yes.

Sydnee: He's winnowing, like an Acotar. He's winnowing.

Justin: Then you know, we did want to mention briefly, in case you ever need to kill him, he has weaknesses. Do you know Superman's weaknesses?

Sydnee: Kryptonite.

Justin: Kryptonite.

Sydnee: I assume if you remove him from the power of the yellow sun, that would be bad for him?

Justin: It slowly weakens him. It basically hinders his photosynthesis abilities, which sometimes makes him like a regular person and sometimes weakens him.

Sydnee: You're talking about removing him from the yellow sun?

Justin: No, I'm talking about the presence of kryptonite hinders his abilities.

Sydnee: The presence of it. So just it being near him.

Justin: Yes. Because you can't just deprive him of the yellow sun, you have to actively like undo the process of—

Sydnee: What is—kryptonite is a rock?

Justin: It is a a mineral... it's a meteorite from Krypton. It's a piece—

Sydnee: That's a rock?

Justin: I mean, it's a piece of Krypton.

Sydnee: I mean but like what do you mean? What do you mean a piece of Krypton?

Justin: So the—

Sydnee: Like dirt?

Justin: No, no, no, the debris that came from Krypton was irradiated. And the—and it's basically like the fact that is irradiated by his home planet. So it's like debris from the Krypton explosion.

Sydnee: So it's a rock.

Justin: Presumably, yes.

Sydnee: It's a green rock.

Justin: Presumably, yes.

Sydnee: And it's emanating radiation.

Justin: Correct.

Sydnee: But it doesn't hurt anybody else?

Justin: So that it hinders his abilities. He is also very vulnerable to red sun radiation.

Sydnee: Mm-hm.

Justin: If you can get him in front of a red sun.

Sydnee: Does it make him normal?

Justin: And then—make him normal. And then my number one favorite is that... is magic. [titters] It's just, because people were writing Superman and they could say anything they want. But they straight up are just like, "No magic." Because they had—they came up with and they had to answer why Superman doesn't just like blast him. And apparently it's just magic. Now, I do want to—I want to close out here with one small note. It's just written in this book here, and it's one of the last things in this section. And it says, "Although you won't hear me say it to his face, I consider Superman a friend." Batman, I would encourage you to let Superman know how you feel about him.

Sydnee: [titters] Heh.

Justin: You guys are in a lot of dangerous situations together. I don't think you should let your machismo get in the way of telling him that, yes, even though you have contingency plan on top of contingency plan about how to kill him should the need arise, you do consider him a friend.

Sydnee: But that's Batman's whole thing.

Justin: Mm-hm.

Sydnee: You know?

Justin: Mm-hm.

Sydnee: Broody and dark and mysterious.

Justin: But he cares.

Sydnee: And he has the mask of being like a jerk that he has to wear when he's Bruce Wayne.

Justin: No, it's actually a bat. It looks like a bat, is his mask.

Sydnee: I mean metaphorical.

Justin: His mask is bat-shaped.

Sydnee: A metaphorical mask of being like the rich playboy.

Justin: What a terrible burden that is. I know how hard it is.

Sydnee: I'm just saying that he's more complicated.

Justin: Oh, yeah.

Sydnee: Superman is more pure. He's just good. He's just trying to do good. He's just good.

Justin: If you want to get into the philosophical underpinnings of these characters, we're going to need a lot more time. Thank you so much for—

Sydnee: I don't. [chuckles]

Justin: I know. Off-mic then, perhaps?

Sydnee: No, that's—

Justin: Maybe I could interest you in some off-mic conversation? Thank you so much to The Taxpayers for the use of their song, Medicines, as the intro and outro of our program. Thank you to you for listening. You're the best.

Sydnee: And I will research a new topic next week that I've not done before, and I'm sorry. And I can't believe I did that.

Justin: Thanks to—I don't mind at all, sweetheart.

Sydnee: Thank you.

Justin: That's gonna do it for this week on Sawbones. 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.

["Medicines" by The Taxpayers plays]

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