

Sawbones 168: Space Medicine

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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'm your cohost, Justin Tyler McElroy.

Sydnee:

And I'm Sydnee Ann Smirl McElroy.

Justin:

That's not your name anymore.

Sydnee:

My—it was Ann.

Justin:

I destroyed Ann.

Sydnee:

[laughs] You destroyed Ann personally?

Justin:

I destroyed Ann with our marriage. There is no more Sydnee Ann.

Sydnee:

There is only Sydnee Smirl?

Justin:

There is only Mrs. McElroy. [laughs].

Sydnee:

Oh, no. Mm-mm. No, that's not gonna fly. I'm sorry. It's Dr. McElroy, please.

Justin:

Doctors Justin—Doctors Justin and Sydnee McElroy.

Sydnee:

No ... Okay, you don't—see, you don't get to be a doctor just 'cause I am.

Justin:

Well, it's just the one doctor at the beginning.

Sydnee:

Could I make sure ... I really wanna make sure you never accidentally get an honorary doctorate. I worry about that—

Justin:

It's—

Sydnee:

With you achieving levels of internet celebrity, there's always the fear that someone will want to give you an honorary doctorate, and then you're going to get to be doctor.

Justin:

[laughs]

Sydnee:

And then... No.

Justin:

What a ch—that is literally my life goal.

Sydnee:

No. [laughs]

Justin:

It's all I want is an honorary doctorate.

Sydnee:

Please, no one ... Everyone listening, do not give Justin [laughs] an honorary doctorate.

Justin:

Everyone listening, tell—talk to people you know who can make that happen for me, okay? Please.

Sydnee:

No. Please.

Justin:

Uh, [laughs] the—the—but it's a new year, Sydnee. It's 2017. That could happen. The year is full of possibilities. We've put away garbage year 2016 in a dumpster where it belongs.

Sydnee:

That's right.

Justin:

And now we've moved onto good year 2017.

Sydnee:

Good year 20—

Justin:

Excellent year.

Sydnee:

Is that the na—[laughs], good year?

Justin:

It's full— good year. It's full of possibilities.

Sydnee:

Mm-hmm.

Justin:

Full of opportunities. This is gonna be the year... I mean, who knows? I'm—I don't know. The sky's—the sky's the limit.

Sydnee:

You're g—you're gonna do Taekwondo.

Justin:

Taekwondo. I'm gonna take some Taekwondo classes, get—become—

Sydnee:

I'm gonna take baths more.

Justin:

Baths. More and more baths.

Sydnee:

[laughs] That's a really important thing.

Justin:

Maybe 2017 is the year we go to space. I talked to you about this.

Sydnee:

Wait, like—like w—you and me go to space, or, like, the human ra—I mean, 'cause you know the human race is... Like, we've been to space. Like, we—

Justin:

No, like, us personally.

Sydnee:

Oh, okay.

Justin:

I mean, if we—

Sydnee:

Just making sure. Like, we've totally been there.

Justin:

The future is moving very fast, and it seems like private space travel is taking off, and I feel like 2017 might be the year that I get to go to space, or become an honorary doctor. One of those two, I think, is almost c—like, law of averages, one of the two is gonna happen.

Sydnee:

Probably not, but since you're interested in space...

Justin:

Mm-hmm?

Sydnee:

Do you want to talk about space medicine?

Justin:

Uh, that sounds very futuristic. Like—like Bones McCoy? That kind of thing?

Sydnee:

No, like—

Justin:

"Dang it, Jim, I'm a doctor, not a—a sp—a..." you know, whatever he says.

Sydnee:

Right. That thing.

Justin:

The second part.

Sydnee:

Mm-hmm. Never wa—never watched. Can't. Mm-hmm.

Justin:

Can't? You saw the movies. Two of the movies.

Sydnee:

Did I see two?

Justin:

You saw... Did you see the one with, uh, Benedict Cumberbatch?

Sydnee:

No.

Justin:

So you saw one of the movies.

Sydnee:

I saw one of the movies. There's someone who is a doctor, not other things, right?

Justin:

Okay, moving on.

Sydnee:

That is the—that is the point of that joke?

Justin:

Sorry, you had something to say?

Sydnee:

Charlie asked me if Tarzan was in Star Trek, and I said, "Yeah. Sure."

Justin:

Yeah. Just to—just to antagonize me, I think.

Sydnee:

Just to antagonize Justin. L—no, space medicine is a real thing, honey.

Justin:

I know.

Sydnee:

Okay.

Justin:

Yeah.

Sydnee:

Well, I—[laughs] I didn't know if you really knew.

Justin:

The dumb thing is a bit. I mean, I'm—I'm a sharp guy.

Sydnee:

[laughs].

Justin:

I'm not gonna... I mean, I'm not, like, the top of the pack. But, like, I'm in the middle somewhere.

Sydnee:

Space medicine is a real thing. People really, you know ... I mean, the— as you can imagine, outer space, humans in outer space, presents a whole new set of challenges for, like, what does that do to the human body.

Justin:

Mm-hmm.

Sydnee:

And so there is not a long history when it comes to space medicine, because, you know, we had to figure out that we could go there first.

Justin:

Sure.

Sydnee:

Um, but it is really interesting because the—the history of space travel is so... There's this accelerated timeline that happens, where we kind of had to figure things out really quickly. So, likewise, doctors had to figure things out really quickly.

Justin:

Mm-hmm.

Sydnee:

So it's interesting. Not necessarily in the—in the usual Sawbones fashion of stupid stuff, though.

Justin:

Interesting.

Sydnee:

It's more just really smart, interesting stuff.

Justin:

Well, let's hear about it.

Sydnee:

So in May 1961, JFK said we're gonna put a man on the moon within the decade.

Justin:

And then one guy in the room shot his hand up and was like, "Dibs."

Sydnee:

[laughs]

Justin:

He was like, "No, I mean, we'll pick that later."

Sydnee:

[laughs] "We'll—we'll pick who it is later."

Justin:

"We're not picking it now, Doug. Put your hand down, Doug."

Sydnee:

"This is—this isn't first come..."

Justin:

First served.

Sydnee:

It's not like shotgun.

Justin:

Yeah, Doug.

Sydnee:

Um, this was, of course—

Justin:

That man was a young Joe Biden. End story. You know?

Sydnee:

[laughs] That would be a young Joe Biden.

Justin:

[laughs]

Sydnee:

I love Joe Biden. NASA was not very old. NASA was only a few years old at this point.

Justin:

Mm-hmm.

Sydnee:

Um, so obviously this was challenging from a technical perspective, you know, space flight. But also from a medical perspective.

Justin:

Mm-hmm.

Sydnee:

Because what—we can't study humans in space until we put them there. We can kind of replicate some conditions on Earth, but it's very difficult. So there were a lot of questions. People had already been studying it for a while. We'd been studying this concept really since the '40s. Um, but nobody had all the answers.

There was some groundwork already laid for this. The—the birth of space medicine is really when we look back to, like, early flight medicine.

Justin:

Mm-hmm.

Sydnee:

So as we got better at building airplanes that went faster and higher, we had to deal with the effects of speed and altitude on humans.

Justin:

Mm-hmm.

Sydnee:

And so—so we had some of that kind of research and data that we could extrapolate from, if that makes sense.

Justin:

Mm-hmm.

Sydnee:

Like, well, if we're thinking to launch somebody into space, we have to go this much faster. This much more velocity would have this effect on the human body, et cetera, et cetera.

Justin:

Sure. Because we've been testing stuff like that since, I would assume, since, you know, planes were—became part of the military.

Sydnee:

Since the... Yeah, exactly. Well, since the Wright Brothers flew.

Justin:

Sure, yeah.

Sydnee:

Um, specifically, the Air Force, obviously, did a lot of this research, and its predecessor, the Army Air Corps, because the Air Force was originally part of the Army.

Justin:

Yeah. I knew that actually.

Sydnee:

I'm impressed. I know that because my Papa was in it.

Justin:

Oh, okay.

Sydnee:

Yeah. Since World War I, the flight surgeon was an essential part of the team, and a flight surgeon has more than just a medical role. Obviously, they take medical care of pilots, but they also have to ensure standards for pilots for physical and medical fitness. They also played a role in, like, developing the gear and the equipment that would be used to protect humans in these new atmospheric and whatnot conditions, which is a really interesting role for a doctor to play, and an integral part of doctors who work with space medicine now.

Justin:

Mm-hmm.

Sydnee:

It's not just doing exams and diagnosing people and treating them. It's—I mean, they have, like, a technical job, too.

Justin:

Right.

Sydnee:

You know, developing space suits and whatnot, as an example.

Justin:

Right. Okay.

Sydnee:

So it's a really interesting field of medicine for that reason. Um, and, like I said, we already kind of had some roots in flight medicine, because not only were we putting people in planes, but we also had been sending people up really high in balloons for a while.

Justin:

Mm-hmm.

Sydnee:

Like, if you look at a lot of the really early altitude studies—

Justin:

Like on purpose?

Sydnee:

Yeah, like we were putting people in hot air balloons, and just being like, "Just go really high and let's see."

Justin:

"Let us know."

Sydnee:

"Let's see what happens."

Justin:

"Yeah. Take this camera up and just record yourself until you lose it."

Sydnee:

[laughs] There are all these records you can read about, like, "And then this guy went this high in a balloon, and then this lieutenant went this high in a balloon." And everyone was very impressed, which doesn't sound impressive now. Like, you went up in a balloon? [laughs]

Justin:

No, it's super impressive, because if you're, like, a dumb earthling, you know there is a height at which you die.

Sydnee:

That's true.

Justin:

Like, there's a height at which you're gonna die. And, like, you don't know what the lead up to that is.

Sydnee:

[laughs]

Justin:

You don't know, like, how high that is. You don't know how—how close your buddies got. Like, "I hope I'm not the one."

Sydnee:

[laughs]

Justin:

Like, I just feel like there's a height at which you die, and you have to know that. That's intense. I mean, it's slow. Like you would probably see it coming.

Sydnee:

[laughs].

Justin:

Like, "Oh, no, this is feeling a little high."

Sydnee:

"Oh, I feel like I'm not breathing very well."

Justin:

"Oh, no."

Sydnee:

"This is not good."

Justin:

"I have to get back down to Earth in the next three hours."

Sydnee:

We also obviously were investigating how fast humans could go, because, like, we had broken the sound barrier. Chuck Yeager.

Justin:

What's up?

Sydnee:

I thought this was a good m—a moment to mention—

Justin:

West Virginia's own.

Sydnee:

Mm-hmm.

Justin:

The pride of Huntington, West—no, not Huntington.

Sydnee:

Not Huntington but West Virg—

Justin:

Just West Virginia.

Sydnee:

I've met him. I sh—I shook his hand. He hugged me.

Justin:

He's a cool dude.

Sydnee:

He is a cool dude.

Justin:

I feel like we've talked about Chuck Yeager before.

Sydnee:

Have we talked about Chuck Yeager?

Justin:

Because we talked about him when he does the lectures for the Yeager Society, how he'll, um...

Sydnee:

He shows up in sweatpants.

Justin:

He shows up—

Sydnee:

Well, a track suit. A track suit. Yeah.

Justin:

Track suit, and then shows a short film about himself. Which is, like, so rock and roll. And, sorry, if I did something one one thousandth as cool as break the sound barrier, you would never stop—

Sydnee:

[laughs]

Justin:

Like, it's all I would ever—I would be insufferable. Like—

Sydnee:

PS, if you want a treat, follow him on Twitter. Let me just say.

Justin:

Oh, he's crushing it. Yeah.

Sydnee:

Let me just say.

Uh, a lot of early medical advances were also based on research that was gathered after World War II, uh, that was, uh, taken from the Germans. So we took all of the research that they had already been doing and basically kind of open literature published it all by the US military, and said, "Look, this research is out there. Now, we can all use it."

Justin:

Mm-hmm.

Sydnee:

Um, so there were a lot of quick advances that were made by compiling all that research together.

Justin:

Yoink.

Sydnee:

Um, and then they built all kinds of, like, laboratories and different things on earth to try to, like I said, replicate some of these conditions so that we could study them better. So at the US Naval School of Aviation Medicine in Pensacola, they had things like low pressure chambers. They had, like, this radiation laboratory, because everybody was worried, like, what do we do when we get up near the sun, and we have radiation from the sun? We don't know. Uh, there was, like, a slow rotation room, and something called a human disorientation device.

Justin:

Whoa.

Sydnee:

Which sounds, like, weird.

Justin:

That's pretty intense.

Sydnee:

Yeah. Like, I—I always imagine that, like, now we're getting into, like, weird LSD experiments and stuff. [laughs]

Justin:

Yeah, it seems like more of a side a—side effect than, like, a intentional thing.

Sydnee:

Back in the—in the late 1940s, we started with things like seeds and fruit flies, sending them up into space for very short flights, and then bringing them back, and being like, "Did—did they make it?" [laughs]

Justin:

Nope.

Sydnee:

And then we started with—with animals. Things like monkeys, and mice, and sending them up for various periods of time, and then bringing them back.

And, again, a lot of it was, what happens to them when they're in especially weightless conditions was a big question, and then can they make it back? It took us a few years before we, uh, were able to successfully retrieve a mouse from space.

Justin:

What about monkeys? They were all fine, right?

Sydnee:

Well, that took us later. That took longer.

Justin:

Yeah, but they were fine. All the monkeys made it.

Sydnee:

Yeah. They—uh, yeah, Justin.

Justin:

Well, the monkeys were fine.

Sydnee:

Oh, they were a—monkeys were fine.

Justin:

They came back down, got a banana.

Sydnee:

[laughs].

Justin:

Did some funny tricks. Put on a diaper.

Sydnee:

Uh, yeah. That's—that's how it happened. Anyway, moving on. The... At one point—

Justin:

The impressive thing that people don't talk about enough is how long it must've taken to train the monkeys to fly a spaceship.

Sydnee:

[laughs]

Justin:

Because that is, I'm assuming, a very intense thing. You don't just push the "to space" button.

Sydnee:

Um...

Justin:

Like, it's— it's an intensive thing, and I can't—

Sydnee:

Honey...

Justin:

And the work that we had to do to train monk—it, like, of course we'd bring them back safely. They're highly trained astronauts. Duh.

Sydnee:

You know, uh... Well.

Justin:

Duh.

Sydnee:

[laughs] I did—I did read. I know you're joking. I did read that one monkey was trained for, like, 18 months before it was sent up in, like, a simple task so they could witness it doing simple tasks in space.

Justin:

Here's what the simple task—you know what the simple task was? Weirdly, space kung fu.

Sydnee:

[laughs]

Justin:

They were worried about aliens with martial arts training.

Sydnee:

Right. That makes sense.

Justin:

And they spent 18 months training Chimbo, the kung fu fighting chimp, to fight martians they would enc—they didn't know. It was a primitive era.

Sydnee:

Right. We assumed we were going into space to fight martians. [laughs]

Justin:

Yeah, with kung—with monkey kung fu.

Sydnee:

Well, they have Santa. There's that old movie where Santa's on Mars. We have to go save him.

Justin:

With a monkey trained in kung fu.

Sydnee:

Exactly. Precisely. Um, there was this—I was reading about this one, uh, space flight project, Project Mercury, and at one point, there was, like, this note, like, "We kind of ran out of rockets for a bit, and we had to make some more. So we experimented back with balloons."

Justin:

That must've been embarrassing when you showed up to pick one up. They're like, "No, we got—we've not got any."

Sydnee:

[laughs] But they were like, "Well, so we went back to balloons for a little bit, um, so we sent some mice and some hamsters up in balloons and then brought them back to see how that went."

Justin:

That's like—that's like half a Roald Dahl book right there.

Sydnee:

[laughs] That's adorable.

Justin:

Yeah, okay.

Sydnee:

You see them, like, looking up, over the edge of the basket.

Justin:

[high pitched] "How's it going?"

"Bad."

Sydnee:

And so starting from, like, 1949, there are just hundreds of studies that are published testing all these different effects of, like, if we send you up in flight, what happens to fluid, and food intake, and, like, what— how do your kidneys function, and how do you pee in space? And, like, what happens to your eyes? Uh, they did things like, uh, sealed cabin human isolation studies. If we put a human inside this room with other humans, what do— what do they do?

Justin:

Mm-hmm.

Sydnee:

Um, what are the cardio—like, cardio dynamics. What happens to your heart and your vascular system when you're weightless? Uh, things like the psychophysics of weightless, so... I mean, just, like, what happens to your whole body, to all your organ systems, and everything that's happening inside of you? How will you feel and all that?

Justin:

Mm-hmm.

Sydnee:

So they did all these studies. Um, there are lots of them you can read. There was one that I found that was pretty interesting, because I think what was fascinating to me was how worried they were about not just the physical fitness of humans in space but psychologically. I think that's a big consideration, what it will do to you to be trapped in a small room, weightless, with other humans for long periods of time.

Justin:

Mm-hmm. Mm-hmm.

Sydnee:

And you can't leave. And that—that sounds—that sounds upsetting to me personally.

Justin:

Yeah. Uh, yeah, less than ideal.

Sydnee:

So I found one study where they took six men, and they put them in a chamber that allowed about 75 cubic feet per person, and they put them in there for eight days. And they tried at first at, like, a simulated altitude of 10,000 feet, and then they repeated it at sea level to see what altitude had effect on, and that kind of thing. And while they did it, they measured heart rate, respiratory rate, their temperature, the electrical conductance of their skin to look for, like, arousal. Not—not sexual arousal. Like...

Justin:

Yeah.

Sydnee:

Anxious arousal. Uh, tried to see if, like, anxiety—or tried to see if confinement would be too anxiety producing basically. And they had lots of, um, tasks that they gave the men to, like, maintain their oxygen levels. Now, these were simulated tasks.

Justin:

Right.

Sydnee:

They had oxygen, don't worry, but they—they had—they wanted to be like space flight, where you're not just gonna be, like, chilling.

Justin:

Yeah.

Sydnee:

Like, you're gonna be doing stuff. So they had all these tasks that they had them do, and then on day five, they introduced this emergency situation, where everybody had to react very quickly and deal with a lot of stress. And they just took all these measurements, like, every 20 minutes the whole time they did this.

Justin:

Huh.

Sydnee:

Um, and from all this, they concluded that the confinement wasn't really any more stressful than just, like, a base level of... Like, the emergency situation they introduced was pretty stressful, but overall, they handled everything else pretty well.

Justin:

Mm-hmm.

Sydnee:

So they did a lot of studies like that. My favorite—the reason I mention this one is that there's a note in this study, and I like—I love the way scientists write, because what they say is that after they introduced the emergency, as a result, the crew became disorganized and confused in their behavior, and failed to function as a team. After the emergency, the crew tended to blame the experimenters outside the chamber for their confusion, and displayed great hostility by cursing and other aggressive behavior, which lasted the remaining three days of the study. [laughs]

Justin:

[laughs] That's tough to explain your job to people. Like, "I'm an astronaut, except... [sighs] I do all the astronaut things, but the one thing is... I am just, like, in a building somewhere in Florida."

Sydnee:

[laughs]

Justin:

"But other than that, like, I'm an astronaut."

Sydnee:

"Most of the time."

Justin:

"Most of the time."

Sydnee:

"But sometimes I just hang out in this building."

Justin:

Yeah. And—

Sydnee:

"With other—with other dudes."

Justin:

So you go to space and, like, do a bunch of... "No, no, no, no."

Sydnee:

"Not now."

Justin:

"No, no, no. Like—"

Sydnee:

"We don't know how to do that yet." [laughs].

Justin:

"No, we don't know how to do that yet. What I'm mainly doing is just, like, chilling in a very small space, and trying to stay cool."

Sydnee:

Now—now, through all these studies, they— they came up with criteria for astronauts. That was a big part of it was, let's do a bunch of studies and figure out who can go into space, what they came up with a few, like, characteristics. They need to have environmental stress capacity. They need to be tough. They need to be resilient. They need to have motor skills, perceptual skills. They, um, initially said they had to be at least 35. They later changed it to at least 39, just because the technical skills and qualifications they needed, it was hard to meet by 35.

Justin:

Mm-hmm.

Sydnee:

Um, they had to have either an engineering or some kind of scientific degree because of the technical skill you would need. Uh, they could be no more than 5'11".

Justin:

That makes sense.

Sydnee:

Because of the size of the capsule.

Justin:

Stop taking up so much of the spacecraft.

Sydnee:

And so, initially, they choose—they only chose from, like, military test pilots.

Justin:

Mm-hmm.

Sydnee:

Because they wanted people who were, like, tough and fearless. And so that's where they kind of—they went.

Justin:

Sure.

Sydnee:

To the military guys.

Justin:

It's as close as you could get, I would guess.

Sydnee:

Exactly. Exactly.

Justin:

Yeah.

Sydnee:

Um, they did tons of testing on these people. They did eye examinations. They took pictures of their retinas. They did, I mean, really invasive testing. They looked at their larynx, and they—they, um, did EKGs, and tilt table tests, and just all kinds of, like, neurological tests. Um, they made them do, like, seizure tests. The EEG, the thing where they put all the electrodes on your head, and make sure you don't have seizures.

Justin:

Mm-hmm.

Sydnee:

And then made them, like, hyperventilate and do it again, and make sure they were okay. They did... [laughs] they did proctosigmoidoscopy.

Justin:

What is ... Okay. I know what the first pa—half is about, yeah.

Sydnee:

Sort of like a colonoscopy before.

Justin:

Yeah.

Sydnee:

This is, like, an early form of a colonoscopy sort of thing.

Justin:

Mm-hmm.

Sydnee:

Uh, they did a lot of labs, including a stool inspection and a sperm count. [laughs]

Justin:

Yeah. The— well, wait, we do know the Martian women, we don't know how their systems will function. But we want to make sure if it doesn't work, it's not on our end.

Sydnee:

[laughs] That—there was no explanation for this sperm count.

Justin:

Well—

Sydnee:

Can't unders—

Justin:

Maybe they wanted to know, like, if it dropped to zero after they went into space...

Sydnee:

Well, okay.

Justin:

They wanted to say, like, "Listen, no, no, no, no. That was not us, okay? That—you were at zilch beforehand, okay?"

Sydnee:

[laughs] That... Okay, sure. That was just a cover. Cover their butts.

Justin:

Yeah.

Sydnee:

Uh, they did stress tests, pulmonary function tests. They x-rayed them from top to bottom. And then they did a bunch of different tests of, like, their mental and social wellbeing is the way they put it.

Justin:

Mm-hmm.

Sydnee:

They want to make sure that they are psychologically prepared for space travel. So some of—some examples of some tests that they did, one was called the Harvard Step Test, where they just made you step up 20 inches to a platform and down every two seconds for five minutes. They did something called a cold presser test, where you put your feet in a tub of ice water, and then just checked your pulse and blood pressure.

Justin:

I'm sitting here, thinking I could do the Harvard Step Test, but I bet I probably couldn't. I bet it's like power hour, where, like, it doesn't sound like a lot of beer, but, yeah, that's a lot of beer actually.

Sydnee:

[laughs] It sounds pretty bad.

Um, we could do the cold presser test. I could do that, remember? I did it when we were taking that prenatal class.

Justin:

Oh, that's right. Yeah.

Sydnee:

Yeah, I'm really good at sticking my hand in ice water for a long time.

Justin:

[laughs]

Sydnee:

Um, they did a lot of isolation tests where they would just put them in dark, soundproof rooms for three hours.

Justin:

Yeah.

Sydnee:

See how they do. Um, and then there were a lot of other psychiatric tests. They did, like, the Rorschach test, the classic ink blot tests and interviews. Had them, like, draw a person. Finish this sentence. Um, what—something that would determine their, uh, attitudes towards authority.

Justin:

Yeah, makes sense.

Sydnee:

Yeah. And then, um, interpretation of the question, "Who am I?"

Justin:

Hmm.

Sydnee:

Hmm. Who am I? Who am I in space?

Justin:

A mar—a Martian sympathizer. "Okay, you're out."

Sydnee:

Oh.

Justin:

"You're out."

Sydnee:

"Gotcha."

Justin:

"Gotcha." Fell for the oldest trick in the book.

Sydnee:

Um, there also was a lot that was happening at the time, engineering the suits that they would wear. And just, uh, one interesting note that I found is that early space suits, um, because they were just designed for really short flights at first. I mean, we're talking people were going up in space for, you know, 36 hours or something.

Justin:

Sure, right.

Sydnee:

Um, early suits just had a container that would collect all your urine.

Justin:

Mm-hmm. Dump it when you get home.

Sydnee:

[laughs] Exactly. Just wear that. Wear that. And they also would intentionally eat what we would call, like, low residual diets for a few days ahead of time, meaning diets that would not make you have to BM in space.
[laughs]

Justin:

[singing] And I think it's gonna be a long, long time, 'til touchdown brings me 'round again to find, my bladder bag is totally full... so full, full, full... and I haven't pooooooped. I haven't pooped!

Sydnee:

I—I never knew that's what that song was about.

Justin:

It's about emptying your bladder bag and not pooping. Um, so what—what else, Syd? Tell me more.

Sydnee:

I'm gonna tell you more, Justin, but why don't you come with me to the billing department?

Justin:

Let's go.

[theme music plays]

Justin:

So we were getting closer to the modern era, Syd.

Sydnee:

That's right. So obviously once we figured out we—like I said, we sent people up into space for short flights at first, you know, 30-odd hours and such just to see the effects. Again, our biggest fears were weightlessness, altitude, or weightlessness, radiation from the sun, um, the speed of takeoff was a big concern.

Justin:

Martian layers.

Sydnee:

And then a lot of stuff we couldn't predict. Just what was going to happen to people when they were in space. For instance, when we finally started actually sending astronauts up to the Moon, the question was, is there stuff on the Moon that's dangerous to us?

Justin:

[laughs] We have no idea.

Sydnee:

Now, here's the thing. A lot of scientists did have an idea. The id—the answer was no. Listen, [laughs] we know a lot about space even though we haven't been there. We've not—I mean, that's the thing. When we get into physics, there's a lot of stuff you can predict, especially as, you know, the more you—and I'm not an expert of physics, but the more you understand astronomy and atmospheres and what we know grows and lives in different conditions, you can begin to predict that there—there was not anything on the Moon to worry about.

And so there were lots of scientists at NASA who were saying, "This is insane. We do not need to worry about contamination from the Moon."

Justin:

Right.

Sydnee:

But the government is obviously involved with this as well, and the last they want is a story about how astronauts brought back Moon germs. [laughs]

Justin:

[laughs]

Sydnee:

To cause public outrage and panic. So starting with Apollo 11 and all the way up through, uh, Apollo 14, the astronauts, when they would return from the Moon, were quarantined for three weeks in these little mobile quarantine units, these little trailers. There's actually a really great picture you can find of the astronauts looking out of their—this teeny little window in this quarantine trailer, and they're waving at President Nixon.

Justin:

[laughs]

Sydnee:

Through—through the window. Um, and they would have to stay there for three weeks. There was a doctor who was put into contam—like, put into quarantine with them, and some staff members to check them for Moon germs. [laughs]

Justin:

[laughs].

Sydnee:

For whatever contamination may be there from the moon. Um, obviously, we ended the quarantine. We don't do that anymore because we know that's not a concern, but we didn't. Uh, there's this really funny story, too, that you can read about, uh, from a lot of the NASA scientists and doctors who were involved in these early studies have written and lectured about this extensively, and they talk about that Nixon and his presidential, um, you know... What am I trying to say? Entourage?

Justin:

Mm-hmm.

Sydnee:

[laughs] All approached the quarantine unit, and it automatically triggered this pressure differential to start, and if they had not stopped what was happening, five pounds of pressure quicker or—or something, or—or slower, uh, they almost ended up with Nixon in quarantine with them.

Justin:

Mm-hmm. Really?

Sydnee:

He almost crossed the pressure threshold so that he would've had to be quarantined for three weeks with the astronauts.

Justin:

Oh, my gosh. There are so many—

Sydnee:

Very... Like, like, it was, like, like, a five PSI is what they said within having to be quarantined.

Justin:

There's like—there's, like, a—a lot of wonderful one act play opportunities, if you're looking to adapt anything.

Sydnee:

[laughs]. Uh, he wasn't, and obviously eventually we stopped doing that. Um, since then, of course, we've learned a lot more. We've gone to space many more time. Uh, and it's really interesting. When you read about this, there were a lot of times where the, um, the US and the Russian space programs were sharing information.

Justin:

Mm-hmm.

Sydnee:

Like, scientists were sharing and having, um, conferences where they would exchange information, at times in history where I was very surprised that we were.

Justin:

Really?

Sydnee:

Which was very heartening, and that—I think that's kind of the hallmark of science sometimes is, despite whatever geopolitical, you know, strife is going on, that you see scientists working together because that's their job.

Justin:

Mm-hmm.

Sydnee:

Um, anyway, since then, we've done one other interesting study that I found was back in 2011, they actually had a study called Mars 500. Um, obviously, the next—we've gone to the Moon. What's next?

Justin:

Mars.

Sydnee:

Mars or bust. So Mars 500 was a study done where six men were kept inside a small, simulated spaceship for a year and a half, um, to study, like... Basically, they went to Mars and came back.

Justin:

Mm-hmm.

Sydnee:

Uh, that was the idea. And they even had, like, a simulated Mars landing, and a Mars surface. And they did, like, they drove around on this fake Mars and did little missions, and then got back in their spaceship and flew back home.

Justin:

Don't feel bad for them. Feel bad for the guy that had to hold up the little toy Mars in front of them for a year and a half.

Sydnee:

[laughs]

Justin:

"There it is, boys. We're gonna get there soon." Every day, he had to step forward a quarter inch. Exhausting.

Sydnee:

[laughs] Do you think it was, like, on a little fishing rod?

Justin:

Exactly.

Sydnee:

[laughs] Just hold it up in front of them?

Justin:

Yeah.

Sydnee:

Um, but, again, a lot of that was just to look at what happens when we trap humans in small spaces for a long time. That's a—that's a lot of the big concern.

Justin:

I could've saved them several million dollars. They hate each other's guts.
[laughs]

Sydnee:

[laughs]

Justin:

Like, they're gonna hate each other's guts.

Sydnee:

They actually—they wrote letters to the outside from their regular— and journaled, and they kept... I mean, this is not journaling for their own ... Like, it's not just for Dear Diary journaling.

Justin:

Yeah.

Sydnee:

Like, for scientific purposes to see what their, you know, mental states were like during this, and how they interacted with each other, and to describe their relationships and struggles and stuff. And you can find all that.

Justin:

Mm-hmm.

Sydnee:

Um, so what do you—there are a few things you need to know that from all of this space travel, in addition to some of the things I've named, what have we learned about medically what happens to the human body in space.

Justin:

Well, I don't know. Tell me.

Sydnee:

So here are some—here are some interesting things. First of all, your organs get displaced.

Justin:

Oh, no.

Sydnee:

You don't have gravity.

Justin:

Oh, so they're just gonna be wandering around?

Sydnee:

Well, I mean, they—they don't wander around, but they do shift a bit. They kind of shift up a little bit.

Justin:

No, thanks.

Sydnee:

Yeah. They just kind of—everything kind of moves just a little bit. So from a doctor perspective, could make it a little harder to examine you because everything is not quite...

Justin:

Because where is it, and what's this?

Sydnee:

Well, [laughs] not quite where it usually is.

Justin:

Why is that gurgling?

Sydnee:

[laughs] Um, all the fluid in your body moves up a little bit, so initially when you go in—when you become weightless when you're in zero gravity, uh, like, your face will swell, your eyelids will swell. You'll look flushed, kind of like engorged, if you can imagine all that extra fluid up in your face. Uh, and—and, like, astronauts will describe it as, like, a fullness in their head and face. It's very uncomfortable, I'm sure.

Justin:

Mm-hmm.

Sydnee:

Your diaphragm shifts up a bit, so you can get, like, a barrel chest appearance. Um, but your abdomen will look pretty flat because of that, so...

Justin:

Cool. That's cool.

Sydnee:

That's nice. You get those six pack abs. Um, your vision can change. Because of all that fluid moving upward in your body, it puts extra pressure on your optic nerve, and it can actually change the shape of your eyeball while you're in space.

Justin:

Ooh, weird.

Sydnee:

Um, which will then change your vision a little bit. Uh, in some cases, that'll go back to normal when you return to Earth, but not always. Not always completely resolves.

Justin:

Mm-hmm.

Sydnee:

In addition, another problem with eyesight in space is that stuff that we're used to having around us that just settles on, you know, dust and debris that settles on tables and floors and whatnot ...

Justin:

Sure.

Sydnee:

Is gonna float up all over the place, and can get in your eye. Including things like dead skin.

Justin:

Ugh.

Sydnee:

That will float off you instead of falling off of you.

Justin:

Oh, grody. Okay.

Sydnee:

And, like, maybe little pieces of, like, even, like, metal or things from equipment if you're not careful.

Justin:

Right.

Sydnee:

So infections and irritation of the eye are really common. Um, constipation is a common problem in space.

Justin:

Makes sense.

Sydnee:

Gravity helps us go. Uh, also motion sickness is a common problem at first.

Justin:

Ah.

Sydnee:

And you can imagine that vomiting is a pretty bad scene in weightlessness, by the way.

Justin:

Yeah. Oh, no, thank you.

Sydnee:

Uh, longer term problems, it's not good for your bones. We know we need weight bearing activity to help maintain healthy bones. Strong, healthy bones.

Justin:

There's— there's some— I know in, like, the international space station, there's, like, an exercise area. Like, I know they got a treadmill and stuff.

Sydnee:

Exactly. And that is— that is essential. They have to exercise regularly in space. That's not just to keep the pounds off. [laughs]

Justin:

Right.

Sydnee:

That really is to help maintain bone fitness, because you can get osteoporosis, weakening, thinning of your bones, and then breaks, fractures of your bones as a result. And that's—a little bit of that is gonna happen if you're in space long enough even if you exercise regularly. So that's why it is so important to do that.

On the flip side, your feet will get much softer because your calluses could come off.

Justin:

Great. [laughs]

Sydnee:

So that's kind of nice.

Justin:

Well, uh, so that's one good thing.

Sydnee:

So then you get that.

Justin:

That is amazing to me. It always stuns me, the amount of, like... You think about this. This is one small facet of getting someone, like, to the Moon or to Mars or whatever.

Sydnee:

Mm-hmm.

Justin:

This is one small facet, and we incredibly condensed it, and it still filled 30 minute of, like... And that's one little piece of this whole, huge puzzle.

Sydnee:

And this is just—and let me stress, this is one little piece of the medical ... I mean, I—this is just a brief overview. The intense studies and time and how many different people were working on these projects... I mean, when they talk about even designing the space suit, the first, uh, like, seven astronauts that were chosen after they set up all those guidelines and did all those studies, I mean, they re-tailored—it actually—they talked about how one guy's suit had to continually be re-tailored. I don't know if he was, like, munching on Doritos or something.

Justin:

Yeah, sneaking some snacks.

Sydnee:

But, like—seriously, but, like they—to tailor each suit exactly to the person, and to meet all the specifications, and to try over and over again to keep people safe and healthy, and I—there's just so many things to it.

Justin:

It's amazing.

Sydnee:

And you've had to solve them all. It's amazing.

Justin:

2017. Getting there. I'm gonna do it.

Sydnee:

Justin's going to go to space.

Justin:

I'm just excited.

Sydnee:

I just told him how to.

Justin:

Or become a—or become a doctor. Um, folks, that's gonna do it for us. Uh, thank you so much for, uh, listening to our program. We hope that you have had fun while you've been, uh, uh, uh, listening to it with us. We, uh, we wanted to say... We haven't talked about it in a long time, but we have, um, uh, a PO Box where you can send us stuff. PO Box 54, Huntington, West Virginia, 25706. I want to say a huge thank you to Andy for sending us some holiday beer. Uh, Bess and Mark—

Sydnee:

It was one of the best beers I've ever had in my life. Thank you so much.

Justin:

... Sent us a t-shirt and a book they made called Rest in Pieces. A t-shirt I believe Sydnee is wearing right this moment.

Sydnee:

Yes. I am wearing.

Justin:

Uh, Matt sent some cereal. Uh, Mary Kate made us a plenty toy. She's @jurisprudence on Twitter. Um, check out the stuff she makes. And Melissa sent some Christmas music. Maddie sent a lovely bunny print. Um, Jennifer made a Sawbones and TAZ scents, and Felix made us humors soap. So thank you to everybody who sent that stuff along. We really appreciate it.

Sydnee:

Yeah, thank you all so much.

Justin:

Nobody feel like you have to do that. It's just... It's nice.

Sydnee:

But it's nice when you do.

Justin:

And cards. Lots of cards and stuff, uh, especially around Christmastime that we got.

Sydnee:

Mm-hmm.

Justin:

And so thank you for all those cards and letters.

Sydnee:

Yeah, wedding invitations. Thank you.

Justin:

Wedding invitation—sure. Uh, thank you so much to The Taxpayers for letting us use their song Medicines as the intro now to our program. Thank you, Maximum Fun Network. Their website, maximumfun.org, is where you can find a ton of other very enjoyable, uh, podcasts. One that just moved over there is Rose Buddies. If you like The Bachelor, then you're gonna love Rose Buddies. If you don't like The Bachelor, you will probably still love Rose Buddies.

Sydnee:

If you like McElroys, you're going to like Rose Buddies.

Justin:

Rose Buddies is—

Sydnee:

And you do, because you're listening.

Justin:

It's my little brother Griffin and his wife Rachel talking about The Bachelor and drinking wine. Uh, it is an excellent show. Um, and, folks, that's gonna do it for us unless, Syd, do you have anything to add?

Sydnee:

No, that's it.

Justin:

All right. Well, thank you so much for listening. Until next week, 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]

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