Sidedoor (S10E13) – Jeepers Leapers!

Lizzie Peabody: This is Sidedoor, a podcast from the Smithsonian with support from PRX. I'm Lizzie Peabody.

Lizzie: 2024 is a very special year. It brings something that only happens every four years, which stirs up emotions, causes a certain amount of chaos, but is nevertheless an integral part of what keeps our society going. No, I am not talking about the presidential election—it's those extra 24 hours that make up one special day: February 29, Leap Day.

Lizzie: And that is exactly what today's special episode is all about: Leap Day fun facts, like why do we have to add a day to the calendar every four years? And will I get paid for working an extra day in February? We've got questions, and we know someone at the Smithsonian with answers. So in honor of Leap Day, I hope you enjoy my conversation with Bob Craddock, a geologist at the Smithsonian's National Air and Space Museum's Center for Earth and Planetary Studies. Enjoy!

Lizzie: *Okay, Bob. This year, 2024 is a leap year. What is a leap year?*

Bob: *Well, a leap year is a year where we insert an extra day at the end of February to adjust for the time difference it takes the Earth to actually orbit the Sun. We're used to there being 365 days in a year, but it actually takes the Earth 365 days, five hours, 48 minutes and 56 seconds to complete one orbit. So if we didn't have a leap year, what would end up happening is that the days would start shifting. Then in about 700 years, June and the weather that we expect, the summer weather we expect in June, actually occurs in December.*

Lizzie: *Wait, how long would it take for June to become December?*

Bob: *About 700 years.*

Lizzie: *So in terms of what the leap year is, a leap year is the one year every four years when we make up for lost time.*

Bob: *Right.*

Lizzie: *Let's get really big picture here, and kind of go way back in time because I feel like to understand leap years and how it works, we kind of have to understand how solar years work, and why it is that our days and months add up to the years that we have. So the length of the year is determined by the Earth's orbit around the Sun—one solar year. Why is Earth orbiting the Sun?*

Bob: *Back in the beginning when everything was being put together and created, some sort of a supernova giant thing blows up, throws a bunch of particles and material out into space.*

Lizzie: And those particles formed a kind of dust cloud that spins faster and faster in the same direction—like when you flush a toilet—until it flattened out into a disk. And the stuff at the center became the Sun, and the rest of the stuff became the Earth and all the other planets.

Lizzie: And so to put it really simply, our orbit was determined by where our cluster of particles just happened to be when gravity pulled them all together and formed the Earth, a little over 90 million miles from the center of our solar system, AKA the Sun. And to travel around the Sun at that distance, it takes about 365 days and a quarter. And of course, the length of a day is how long it takes the Earth to make one rotation on its axis. But why is the Earth spinning on its axis?

Bob: *What we believe now what happened was that there was a proto-Earth, an early Earth, not quite as big as what we have right now, but pretty close in size. And nearby, there was an object about the size of Mars, which we've called Theia. Theia ended up crashing down onto the Earth, and that giant impact imparted the angular momentum, the spin that we have on the Earth. So our planet spins the way it does because of that last giant impact, the stochastic event that gave our planet a push and started spinning in space. The other thing that happened with the giant impact with Theia is that not all of that stuff went into forming the Earth.*

Lizzie: *Oh!*

Bob: *So a lot of the ejecta from Theia went off into space, and eventually they came together to form one big object that we call the Moon.*

Lizzie: *Really? The Moon came from that impact?*

Bob: *That's right.*

Lizzie: *That is fascinating. How long ago did this happen?*

Bob: *Well, the Earth is about 4.5 billion years old, so this happened within the first 100-200 million years of Earth's history.*

Lizzie: *To make sure I understand this correctly, the reason the Earth spins on its axis is because long, long ago, the proto-Earth, which was a little smaller than the Earth we have today, and this other planet named Theia collided. Theia whacked into Earth, tilted it on its side, set it spinning. The two of them molded together, and then the molten hot material that came spraying out of that impact collected in the Earth's gravitational pull and formed the Moon.*

Bob: *That's right.*

Lizzie: Or at least, Bob says, that's the generally accepted theory. And then Bob told me something that really surprised me: year by year, the Moon is actually getting farther away from the Earth.

Bob: *And it causes the spin of the Earth, our days to get longer. So millions of years ago, like when the dinosaurs were around, the Earth's day was only 24 hours long, as opposed to 24 hours long.*

Lizzie: *Wow!*

Bob: *And even shorter billions of years ago when the Moon first formed, because it was so much closer to the Earth.*

Lizzie: Bob says if you think about a figure skater spinning on ice, you notice that when the figure skater has their arms close to their body they spin super fast in this tight circle. But if they extend their arms away from their body, they spin more slowly. The same is true as the Moon gets farther away from the Earth, it slows down the Earth's rotation.

Bob: *So our days are actually getting longer over time, geologic time, as the Moon drifts further and further away from us.*

Lizzie: *What does that mean about, like, eclipses and stuff?*

Bob: *Another great question. I was gonna get to that, because we do have a total eclipse going*

across the United States early in April this year.

Lizzie: *Yeah.*

Bob: *And we live in a very unique period in geologic history where the apparent diameter of our Moon is about the same as the apparent diameter of the Sun. Now the Sun's much bigger and it's much, much further away, 93 million miles away versus 283—238,900 miles away. So—but because the Moon is so much closer than the Sun and where it is in space right now, it has typically the same apparent diameter as our Sun does. So we get these total eclipses, which are just actually magical. Now eventually, as the Moon gets further away from the Earth, we won't have the ability for these total eclipses anymore.*

Lizzie: *Oh.*

Bob: *We'll have—we're already getting these annular eclipses so that the apparent diameter of the Moon is slightly smaller than the Sun.*

Lizzie: *Oh!*

Bob: *So you can get this ring caused by the Sun around the Moon, which I haven't seen before, which also sounds pretty magical.*

Lizzie: *Well Bob, there are a series of fun facts that I've recently learned about Leap Year as I was looking into this topic, and I'm curious if you know any of them.*

Bob: *Okay.*

Lizzie: *All right.*

Bob: *Yeah, quiz me. Great! [laughs]*

Lizzie: *Okay.*

Lizzie: It's trivia time, after the break.

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Lizzie: Okay, we're back, talking about Leap Day with Bob Craddock, a Smithsonian geologist. And while Bob might know a lot about how the Earth was formed, and why that made our year 365 and a quarter days long, does he know non-science stuff about Leap Day?

Lizzie: *So did you know that February 29 has traditionally been a day when women were allowed to propose to men?*

Bob: *Yeah. In fact, there's a whole Amy Adams movie—I'm a total big fan of Amy Adams—called* Leap Year*.*

Lizzie: *[laughs]*

Bob: *Where she's gonna go and propose to her boyfriend on Leap Day. Yeah.*

Lizzie: *Okay. I thought I might get you with that one, but no, you knew it. [laughs]*

Bob: *Yeah, I knew it. Yeah. Yeah. Like I said, big Amy Adams fan.*

Lizzie: *Apparently it comes from this—like, it's mostly celebrated in Ireland, Scotland, England and also Finland, and it comes from a legend about St. Bridget and St. Patrick.*

Bob: *Oh, interesting.*

Lizzie: *Yeah. When, like, St. Bridget went to St. Patrick and said, "Listen, we gotta—you have to let women ask men at some point." And he said, like, "Okay, once every seven years." And she was like, "How about four?" [laughs]*

Bob: *Well, that's cute.*

Lizzie: *Okay, here's my second fun fact. Some cultures consider February 29 to be an unlucky day. Did you know that?*

Bob: *No, I didn't know that.*

Lizzie: *And actually, it extends to, like, an unlucky year. In Italy, there's this saying, "Anno bisesto, anno funesto," which translates to "Leap year, doom year."*

Bob: *Wow. That's kind of scary.*

Lizzie: *Yeah. We're in one now, so ...*

Bob: *Yeah, I know.*

Lizzie: *[laughs] Let's hope it's not true.*

Bob: *Yeah. Well, that's bad luck stuff. I have a black cat and my lucky number is 13, so I don't—maybe this is gonna be a great year.*

Lizzie: *[laughs] So you don't put any faith in that stuff?*

Bob: *No. It's like, come get me. I don't think you can.*

Lizzie: *You probably walk under ladders all the time and step on cracks in the sidewalk.*

Bob: *That's right.*

Lizzie: *You seek them out. [laughs] Yeah, in some countries like in Greece, people warn against planning weddings during leap years, so it's really bad for the wedding industry in, like, Greece.*

Bob: *Oh, wow.*

Lizzie: *Yeah. And another kind of wacky thing: apparently there were three towns in Illinois—this is according to Vox— February 29, it wasn't like a—a legal day, so laws prohibiting women to do certain things, like, didn't count. And so Leap Day was this day when women could, like, run amok.*

Bob: *So—okay, well I'm all for that.*

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Lizzie: *[laughs]*

Bob: *But what period of history are we talking about? I mean, because ...*

Lizzie: *So in Illinois, between 1932 and 1980, Aurora, Illinois, apparently police, firefighters and city council members, like, women could hold these jobs, but the base—for one day, and their objective was to find a husband. So they could, like, jokingly arrest, jail and fine unmarried men if they refused to marry them.*

Bob: *Wow.*

Lizzie: *It's—it's not great, Bob. And then the last thing I found out was that many companies don't recognize Leap Day as a valid day and make, like, Leapers choose February 28 or March 1 as their birthday when registering for things. And if you are paid a fixed monthly income, you probably work for free on the 29th because many employers don't calculate that extra day per year.*

Bob: *Oh, wow.*

Lizzie: *Yeah.*

Bob: *Well you hear that? People need to watch out, make sure—check your paycheck.*

Lizzie: *Check your paycheck, make sure you get the extra day.*

Lizzie: *Well, thank you so much for talking to me, Bob.*

Bob: *Yeah.*

Lizzie: *This was fascinating. I love how something as simple as an extra day in the calendar does get you thinking about all of the crazy mechanisms at play all the time, and how tricky it is to apply these sort of human empirical measurements on the chaos of nature.*

Bob: *Chaos of nature. Yeah.*

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Lizzie: You've been listening to a special Leap Day episode of Sidedoor, a podcast from the Smithsonian with support from PRX.

Lizzie: To learn more about the science of how the Earth was formed, and how that determined the length of our days and years check out our newsletter. You can subscribe at SI.edu/Sidedoor.

Lizzie: For help with this episode, we want to thank Bob Craddock.

Lizzie: Our podcast is produced by James Morrison and me, Lizzie Peabody. Our associate producer is Nathalie Boyd. Executive producer is Ann Conanan. Our editorial team is Jess Sadeq and Sharon Bryant. Tami O'Neill writes our newsletter. Episode artwork is by Dave Leonard. Extra support comes from PRX.

Lizzie: Our show is mixed by Tarek Fouda. And our theme song and episode music are by

Breakmaster Cylinder.

Lizzie: If you have a pitch for us, send us an email at Sidedoor(@)si.edu! If you want to sponsor our show, please email sponsorship(@)prx.org.

Lizzie: I'm your host, Lizzie Peabody. Thanks for listening.

Lizzie: All right, are we done? Okay, I'm gonna leap my little behind out of here and get some lunch at IHOP. Get it? [laughs]

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