

## Lights Out

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

[MUSIC]

Lizzie Peabody: Diane Turnshek loves stars.

Diane Turnshek: I have a countertop that looks like the Milky Way in cement with embedded with hundreds of fiber optic cables for stars.

Lizzie Peabody: And she's always loved stars. Ever since she was a little kid.

Diane Turnshek: I used to tell people I wanted to be a theoretical nuclear astrophysicist. And when you're seven and you say that, people's eyes bug out.

Lizzie Peabody: Yeah.

Diane Turnshek: And I kind of—. I liked that. I liked that expression on people's faces. So, I was like, "Oh, I better do that thing."

Lizzie Peabody: "I've told everyone this is what I want. Now I have to do it."

Lizzie Peabody: And Diane did that thing. She went to school. She became an astronomer.

Diane Turnshek: Ended up with a graduate degree. But then, having children changed that.

Lizzie Peabody: Diane chose to step away from her career to raise her four boys in Pittsburgh. But, once they got older, she was ready to turn her gaze skyward again.

Diane Turnshek: The Mars Desert Research Station was actively accepting applicants. In fact, anybody can go. You just have to apply.

Lizzie Peabody: This research station is in the Utah desert, and it simulates life on Mars. So, in the summer of 2012, Diane packed her bags and went to live on Mars—A.K.A. the desert—for two weeks. And on her first night out there, she stopped to watch the sun set over the mountains.

Diane Turnshek: The sun went down, and the stars started to come out. One. Two. 10. A hundred. A thousand. It was breathtaking.

[MUSIC]

Lizzie Peabody: If you're not driving or doing something you need your eyes for, I encourage you to stop and close them for a moment. Try to imagine what Diane was seeing: Stars on top of stars on top of stars, all shimmering and twinkling. So bright you can actually see your shadow on the desert floor.

[MUSIC]

Diane Turnshek: You feel small, part of the universe. And you feel like the stars are right nearby. You could reach out and touch them. They're, they're so bright and so close feeling. If you are laying down, you could have they call it celestial vaulting. It's a kind of vertigo that you feel like you're lifting up off the ground into space. I mean, you're not looking up anymore. You're looking out into infinite space. So, it's an experience that you realize that we're living on a tiny little sphere in the middle of an enormous universe.

Lizzie Peabody: Diane, an astronomer, had taught students about the Milky Way, the hundreds of billions of stars that make up our galaxy, swirling all around us, illuminating the night sky. But living in Pittsburgh, the glow of city lights had blocked her own view of the Milky Way for more than two decades.

Diane Turnshek: Seeing that again, after so long, I realized what I'd been missing. It took me by surprise because I had forgotten, of all things, the Milky Way.

Lizzie Peabody: Diane had an epiphany.

Diane Turnshek: I need to do something about this. I need to change this. I need to change the world.

[MUSIC]

Lizzie Peabody: Artificial lighting has opened up a whole new world for us, giving us the ability to walk and drive and read signs at night, to live the way we choose at any hour. But it also affects us in ways we may not yet see. 80 percent of people in North America can't see the Milky Way because we're constantly surrounded by artificial lighting. And every year, across the globe, we're able to see fewer and fewer stars. But Diane is on a path to change this. To take back the night sky. To turn the lights out. And she's not the only one on this journey.

[MUSIC]

Lizzie Peabody: So, this time on Sidedoor, we are illuminating light pollution. How did we find ourselves surrounded by a glowing shroud of electricity and can we have the dark without giving up the light? That's coming up after the break.

[MUSIC]

Lizzie Peabody: Diane Turnshek returned from the Utah desert, back to Pittsburgh, with a single goal in mind: to put an end to light pollution. When she wasn't busy with her day job, teaching astronomy at Carnegie Mellon University, she was talking about light pollution with literally anyone who would listen.

Diane Turnshek: I just talked and talked and talked. I talked to people in elevators. Random strangers. I just talked.

Lizzie Peabody: She went to kindergarten classes, reached out to amateur astronomers, held light pollution-themed crafting sessions, even helped some of her students create a light pollution video game.

Diane Turnshek: Just every which way.

Lizzie Peabody: She published a book.

Diane Turnshek: Peter Pan comes down to earth, gathers up the Lost Boys, is trying to find the second star to the right. And straight on till morning...

Lizzie Peabody: Oh, my gosh.

Diane Turnshek: ... they can't find it because of light pollution.

Lizzie Peabody: That's so sad. Wow, what a—. That's a harrowing twist on a children's classic.

Lizzie Peabody: But Diane wasn't just singing the praises of twinkling stars and all their majesty. The problem of light pollution reached far beyond humans and the occasional fictional characters who were unable to get back to Neverland. The negative impacts of excessive artificial lighting extended to all the animal realm. She did a local TED Talk to explain how.

[MUSIC]

Diane Turnshek: 30 percent of vertebrates are nocturnal and twice as many invertebrates are nocturnal. And they have their own patterns. And we've disrupted this ecosystem with our hundred-year, basically, change of the lights all over the world. You've heard the story of, say, sea turtle hatchlings on the beaches, especially in Florida, where 90 percent of them come up to hatch. They are looking for the shimmering light on the, moonlight on the water and, instead, they go up to the shimmering boardwalk lights. And thousands of them, every year, these little hatchlings are killed till we now have an endangered species.

Lizzie Peabody: Light pollution doesn't just wreak havoc on turtles. Frogs are also vulnerable to excessive light. That croaking you hear at night is a mating ritual. But if there's too much light,

the frogs don't know it's nighttime. They don't croak and they don't mate. Light pollution interferes with the natural life cycles of many insects and plants. But there's one animal it hurts more than any other by far. Deep within the Smithsonian's National Museum of Natural History, out of sight of visitors, there is a maze of metal lockers. I feel like this is like if Alice in Wonderland, if you got stuck in, like, Through the Looking Glass, but in like a high school gym locker room or something. Brian Schmidt is guiding me through this labyrinth. Yeah. How do you even know where to go?

Brian Schmidt: Well, I've been working here 28 years, so I have a fairly good idea on where everything lives.

Lizzie Peabody: Brian is a museum specialist. That specialty? Birds. And, wow, do we have a lot of them.

Brian Schmidt: So, we have about 600,000 birds in our collections.

Lizzie Peabody: Brian has chosen birds from the collection to be featured in the National Museum of Natural History's new exhibition on light pollution called "Lights Out: Recovering Our Night Sky." He leads me to the back of, like, the fifth row of lockers, opens up a metal door, and pulls out a flat drawer covered in small, brown birds.

Brian Schmidt: Here we go.

Lizzie Peabody: Oh, my gosh. Row after row of stuffed swamp sparrows. He picks one up and reads the tiny tag tied to its little leg.

Brian Schmidt: So, the back of the tags has the museum catalog number. I actually prepared this bird, and it was my 9,013th bird that I've prepared.

Lizzie Peabody: Wow, that's a lot of birds, Brian.

Brian Schmidt: I've been doing this for about 30 years.

Lizzie Peabody: The tag says that this was a young bird.

Brian Schmidt: So, this bird was hatched the previous summer.

Lizzie Peabody: Oh, wow. So, it was making its first migration.

Brian Schmidt: It's less—. Making its very first migration less than six months old.

Lizzie Peabody: Brian says it died by running into a building here in Washington, D.C. Migratory birds like swamp sparrows and white-throated sparrows are more likely to die by running into

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buildings. They travel thousands of miles across the continent twice a year, once in the spring, again in fall. And like many migratory birds, they travel in flocks.

Brian Schmidt: So, birds that are flying together, you know, will hit buildings together.

Lizzie Peabody: And if you're wondering just how many birds die this way each year.

Lisbeth Fuisz: Somewhere between 300 million or 1 billion birds, migratory birds, a year die in the United States from window collisions.

Lizzie Peabody: A billion birds a year?

Lisbeth Fuisz: Yeah. Just in the United States.

Lizzie Peabody: Wow.

Lizzie Peabody: This is Lisbeth Fuisz. She's with Lights Out D.C., a volunteer group that donated the swamp sparrow and thousands of other birds to the Smithsonian. During each migration season, Lisbeth and other volunteers walk around the city and look for birds that have flown into buildings.

Lisbeth Fuisz: We go early in the morning because many birds migrate at night.

Lizzie Peabody: And when she says "early," she means early. 6 AM. It's still dark out as we walk the streets of downtown D.C., which I didn't realize is a popular rest stop on the Atlantic Flyway. Essentially, a highway for migrating birds.

Lisbeth Fuisz: Millions of birds go north and south twice a year over the Atlantic Flyway. So, like, while we're sleeping, they're very busy.

Lizzie Peabody: As we walk along, Lisbeth points out the office buildings that are most hazardous to birds. And I would layer some of the sound of us walking right here, but Lisbeth made fun of podcasts that do that.

Lisbeth Fuisz: You know, there's always, like, that ambient noise as they go along.

Lizzie Peabody: Crunch. Crunch. Crunch.

Lisbeth Fuisz: Yeah.

Lizzie Peabody: We do have a garbage pail rolling along.

Lizzie Peabody: And as we walk, I'm dismayed to realize the most dangerous buildings are inevitably the most beautiful, like the ones you'd see on the cover of Architectural Digest. We stop in front of a building with one of these distinctively dangerous designs. The front entrance is basically a big wall of glass.

Lisbeth Fuisz: It's very open feeling. And behind it is a large atrium that the office buildings look on to. And in this atrium is literally, like, a forest of bamboo. Quite tall. Maybe two-story tall bamboo. And that bamboo is down lit from lights above and then there's lights all around the perimeter of the atrium.

Lizzie Peabody: Like Lisbeth said, migrating birds travel at night, which is why light pollution causes so many problems for them. Imagine you're a bird. It's been a long night of flying. You're ready to take a break—drink a little water, maybe eat some worms or bugs—and you see a nice little sunny spot with a pond and some trees to chill out on. But you have no idea that what you thought was a ray of sunshine was actually a bunch of LED lights. And there's a wall of glass between you and your little oasis.

Lisbeth Fuisz: And I think you can actually see—. Do you see there's a kind of smudge?

Lizzie Peabody: Lisbeth points out a little smudge about two stories up the glass, kind of like a handprint on a car window.

Lisbeth Fuisz: I don't know if you see that. There's a big smudge. It's quite likely that that's a bird strike.

Lizzie Peabody: How many birds has Lights Out D.C. found outside this building?

Lisbeth Fuisz: We have found hundreds of birds at this building.

Lizzie Peabody: There are buildings like this in every major city across the world. Many leave their lights on all night long, even when there's no one inside. And, yes, glass windows on buildings can be dangerous to birds for multiple reasons. But Lisbeth says light makes these windows so much more dangerous. If there was no light inside the buildings at night, birds wouldn't be attracted to what's on the other side of the glass and they wouldn't fly into it.

Lisbeth Fuisz: So, if you turned off the light, you would have a lot less collisions at these buildings.

[MUSIC]

Lizzie Peabody: There's more and more research every day about how light pollution affects humans, as well. Excess night light has been shown to mess with our circadian rhythms and our

ability to sleep well. Researchers link it to higher rates of depression in teens, and some studies are finding that exposure to too much light may be connected to higher rates of some cancers.

[MUSIC]

Lizzie Peabody: There's also our cultural connection to the night sky. Many of our cultures, beliefs, histories, and rituals are deeply intertwined with the night sky. Our planets are literally named after Greek and Roman gods and goddesses. But Diane Turnshek says we've been ensconced in a luminous fog for so long that entire generations don't realize what a true dark sky is. That you can see the Milky Way IRL. But how do you convince someone to fix a problem they don't know exists?

Diane Turnshek: That's the hardest part, just trying to explain to someone who doesn't know what the Milky Way is, who doesn't know what a dark sky is. How to explain to them that it's important.

Lizzie Peabody: Now, there are solutions. But like with many things, we have to look at how we got ourselves into this situation to understand how to get out of it. And that is coming up after the break.

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Lizzie Peabody: Cities weren't always so bright.

Hal Wallace: In cities in the, the 18th and 19th century, you can see the Milky Way. If you're out in the city for a night on the town, you might hire a local child who knows the city to carry a torch for you...

Lizzie Peabody: Oh, my gosh.

Hal Wallace: ... and light your way to see you home safely, you know.

Lizzie Peabody: The pre-Uber Uber.

Hal Wallace: An escort.

Lizzie Peabody: An escort. Yeah.

Hal Wallace: Yes.

Lizzie Peabody: There we go.

[MUSIC]

Lizzie Peabody: This is Hal Wallace, curator of the electricity collections at the Smithsonian's National Museum of American History. He says humans have always been afraid of the dark.

Hal Wallace: Fear is a good way to describe it. Because you can't see very far off into the darkness. Who knows what's out there, what predator might be lurking at the edge of that campfire light?

Lizzie Peabody: Before modern lighting, nighttime in the city was a time of drunken debauchery. Crime. The witching hour. It was also just harder to get anything done after sunset. If you've ever been in a power outage, you know how tricky it is to read or cook by candlelight. In the early 1800s, many American cities started installing gas streetlamps. Upper class families could even get gas lighting in their homes. Keep in mind the light was still pretty dim. It flickered and it smelled pretty bad. But that was sort of how people lived in the U.S. for most of the 19th century. Until Thomas Edison was like, "Gas lighting? Pssh. I have something that's going to blow you away." And on New Year's Eve, 1879, he did.

Hal Wallace: Edison invites the world to Menlo Park. He lights the lab, the office building, the grounds of the Menlo Park lab. Oh, yeah. And Sarah Jordan's boarding house across the street where a lot of his team lived. With about a hundred or so of these new incandescent lamps.

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Hal Wallace: People looked at these and they—. It was just a mystical experience. Many of them broke down and cried. I mean, it just just—.

Lizzie Peabody: Really?

Hal Wallace: They had that emotional, awestruck experience.

Lizzie Peabody: Edison's incandescent bulb created the equivalent of 16 candles, enough light to carry on your daily pursuits well past sundown. And these lights were also stable. No flicker. They didn't smell like gas. And they could go anywhere. Stores, homes, streets, factories. This created an explosion of light.

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Lizzie Peabody: Author Robert Louis Stevenson wrote...

Speaker 5: Sundown no longer emptied the promenade; and the day was lengthened out to every man's fancy. The city-folk had stars of their own; biddable, domesticated stars.

Lizzie Peabody: But Thomas Edison and his financier, J.P. Morgan, weren't light fanatics. They were capitalists. And in 1892, they teamed up to create General Electric. The point wasn't to sell light bulbs. It was to sell equipment that made electricity.

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Hal Wallace: And it was a major portion of their profits. Up until 1900, maybe 1910 at the latest, as much as 80 percent of electric power that's being generated in the United States is going into powering lights.

Lizzie Peabody: Light equaled money. The more light people used, the more money utility companies made. By the 1930s, electrical lighting was popping off in almost every city and town in America. The people running utility companies were drinking bootleg champagne and cackling over piles of cash. That is until the Great Depression.

Hal Wallace: People aren't using as many lights, and it freaks out the lighting industry. And in 1933, they come up with this national sales campaign called "Better Light, Better Sight."

Lizzie Peabody: Essentially, more light equals more safety.

Hal Wallace: And it's all about getting more and more and more light out into people's homes, into the cities.

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Lizzie Peabody: More and more families wired their homes for electricity. Drivers expected roadways to be brightly lit. Cities installed as much light as they could in their downtown business districts. Think of a theater marquis surrounded by light bulbs, towering neon restaurant signs. Businesswise, it was survival of the brightest.

Hal Wallace: If you have a retail business in, you know, in a downtown area, you're going to have a very bright showroom window. And if your competitor next door has a brighter showroom window, you're going to bump the lighting in yours, so that you can, so that you can stay competitive.

Lizzie Peabody: Now, the effects of all this new light started to be felt in the early 1940s. That's when first reports of what we, today, know as light pollution started coming out. At the time, they called it "sky glow." And it was great news for America's enemies.

Hal Wallace: Early in World War II, the German submarines, the U-boats, are operating off the Atlantic Coast and off the Gulf Coast of the United States. And the German sailors refer to this as the "happy time," because they're sinking merchant ships right and left. Because those merchant ships are illuminated. They're silhouetted against the brightly lit American coastline.

Lizzie Peabody: Coastal U.S. cities like Boston and New York were so bright they were basically like spotlights shining on American ships at sea. And this was creating all sorts of problems for America's war effort. This is from an article in the Boston Globe in May of 1942...

Speaker 5: Everyone who has been to sea, or even out in the darkness of the country, knows the umbrella of radiance which hangs brilliantly over every city, active town, or industrial concentration. Like the spray from a fountain, light from the sky glow radiates out in all directions.

Hal Wallace: And the government is pleading with people to turn off lights. Many people don't. Business owners say, "Look, if I turn my lights off, I'm going to go out of business."

Lizzie Peabody: So, a lot of people just refused to turn their lights off.

Hal Wallace: I mean, we've seen, with the recent pandemic, just how receptive many people are to government mandates.

Lizzie Peabody: Right.

Hal Wallace: This is nothing new.

Lizzie Peabody: So, what happened?

Hal Wallace: Bodies and wreckage are washing up on the shore daily. because the U-boats are sinking these merchant ships.

Lizzie Peabody: Wow.

Hal Wallace: And people are not cooperating.

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Lizzie Peabody: Even with lives at stake, people chose to keep the lights on. Light was an unstoppable juggernaut. A mainstay of American society. After the war, things only got brighter. The Rural Electrification Act brought electrical lighting to all the darkest nooks and crannies of the American countryside. Wartime innovation and inventions from abroad gave us all sorts of brighter lights.

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Lizzie Peabody: Low-pressure sodium. Fluorescent. Mercury vapor. Light was everywhere and getting brighter. A new generation was coming up in a world where 24-hour artificial lighting was the norm. And this was also the 1960s, a time when people started to look at industrial production and ask, "Hold on. What is this doing to us and our planet?"

Hal Wallace: This entire era is beginning to become conscious of the unintended consequences, what the economists call "negative externalities," of our industrial society.

Lizzie Peabody: The words "pollution" and "light" started being used in the same sentence. But at this time, environmentalists were trying to stop poison from going into our water and our air. A few stray photons didn't exactly make the top of the priority list. So, light pollution took a backseat to other types of pollution. And all the while, our skies kept getting brighter. And then, around the early 2000s, things really jumped up a notch with a new, energy-efficient light bulb: the high-efficiency white LED.

Hal Wallace: LED is an acronym. It stands for light-emitting diode. And it basically is a computer chip, a transistor, that emits light.

Lizzie Peabody: LEDs created the same amount of light as one of Edison's old incandescent bulbs for less energy. And that's pretty great if you're trying to burn less fossil fuel. There's a big "but" here, though. Instead of choosing to use less energy, we basically chose to use more light.

Hal Wallace: If you replace a hundred-watt high-pressure sodium lamp with a hundred-watt LED, that LED is going to pump out a whole lot more light. So, the night sky gets brighter.

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Lizzie Peabody: LEDs are everywhere. Homes, offices, factories. Light is plentiful and cheap. So, it's not going to bankrupt you if you leave your porchlight on all night or for an office building manager to leave their fluorescents buzzing 24/7. But Diane Turnshek says, even though it's getting less expensive to create more light, it is still cheaper just to turn the lights out. A few years ago, she helped convince her university, Carnegie Mellon, to turn their lights off during bird migration season.

Diane Turnshek: And we turned out 10 different installations of mostly decorative lighting from midnight to 6 AM. Saved thousands of dollars. And so, the facilities people decided never to turn those lights on again from midnight to 6 AM, because—. Not just during migratory season, but all year round, they're off. It's the money.

Lizzie Peabody: Heck with decoration. It's about the bottom line. Diane says this has been the message that resonates when she talks to people about light pollution.

Diane Turnshek: It's their pocketbook.

Lizzie Peabody: Oh.

Diane Turnshek: That's, that's where you have to hit them.

Lizzie Peabody: Of course.

Diane Turnshek: So, it's cheaper to have less light.

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Lizzie Peabody: But to make real progress, to help birds and bring the stars back, we have to make widespread systematic change. And in the years after Diane returned from the Utah desert, she found a way to do just that. She pushed the mayor and the city council of Pittsburgh to tackle light pollution in their city. And in the fall of 2021, she made a breakthrough.

Diane Turnshek: You'll notice soon that the lights in the city of Pittsburgh are going to start to change a little bit. Today, Mayor Peduto announced a new Dark Sky Lighting ordinance. It is the first of its kind in the country.

Lizzie Peabody: Diane was instrumental in pushing for this Dark Sky ordinance. It says that, whenever the city builds something new, renovates or replaces lighting on the streets or in parks, it will use dark sky friendly lighting. And dark sky friendly lighting doesn't mean less light. It means being smarter about how we light things.

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Lizzie Peabody: Diane says smarter lighting is better for everyone. And it's something we can all start doing right away. Hal Wallace says, "Light with intention. Don't use any more light than is necessary."

Hal Wallace: If you're trying to light your driveway, you want it to light your driveway, not the trees alongside the driveway.

Lizzie Peabody: And maybe you don't even need the lights you think you do. If it's not serving a purpose, just turn it off. He says, if you do need outdoor lights, think about installing controls on them. Things like timers. Or maybe you can use a smartphone app that lets you dim your lights. Hal's optimistic that, someday, we might be able to pause in the middle of a city street, look up, and see the Milky Way again. He references a theory from political scientist John Kingdon.

Hal Wallace: The difference between a condition and a problem is a condition is something we just have to live with. A condition becomes a problem when enough people decide (A) it's something that's got to be dealt with and we can deal with it. And that's where we are with light pollution now. It's not just a condition. More and more people are beginning to realize (A) that it's a problem and that the problem has a solution. And it's amazing what we can do when we work together.

Lizzie Peabody: A century of progress and spectacular innovation has left us living in the long shadow of light pollution. But we have an advantage in solving this problem. Unlike other types of pollution, light doesn't stick around in an environment for years after. It can literally be solved at the speed of light.

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Lizzie Peabody: With the flip of a light switch, we can save the lives of countless birds, frogs, turtles, insects. And we can reclaim the sense of awe that comes with seeing a truly dark sky. That feeling of connection to all living things, that we're all floating through this vast galaxy together.

Diane Turnshek: When you're under a clear dark sky, you feel like the whole planet can see the same stars. If you're far away from your loved ones, you see the same moon, you see the same sky. It brings the whole world closer.

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Lizzie Peabody: You've been listening to Sidedoor, a podcast from the Smithsonian with support from PRX.

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Lizzie Peabody: To learn more about the Smithsonian's exhibition "Lights Out: Recovering Our Night Sky," check out our newsletter. We'll include some photos of our tour with Lights Out D.C. And you can see some of the birds we looked at at the National Museum of Natural History. You can subscribe at [si.edu/Sidedoor](http://si.edu/Sidedoor).

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Lizzie Peabody: For help with this episode, we want to thank Diane Turnshek, Brian Schmidt, Lisbeth Fuisz, Jill Johnson, Ryan Lavery, Juliana Olsson, Kim Arcand, Ruskin Hartley, and Hal Wallace.

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Hal Wallace: And I encourage everyone to go see "Lights Out" at the Natural History Museum while it's up and come over to American History and see "Lighting: A Revolution."

[MUSIC]

Lizzie Peabody: The "Lights Out" exhibition opens March 23rd and it includes way more cool stuff than we could fit in this podcast. But if you can't make it to the museum, you can participate in Earth Hour from anywhere.

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Diane Turnshek: Earth Hour is the last Saturday in March, every year, from 8:30 to 9:30 PM in your time zone and people turn off their outdoor lights.

Lizzie Peabody: So, keep an eye out for that.

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Lizzie Peabody: 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, Sharon Bryant, and Lara Koch. Tami O'Neill writes our newsletter. Episode artwork is by Dave Leonard. Fact checking is by Adam Bisno. Extra support comes from PRX. Our show is mixed by Tarek Fouda. Our theme song and episode music are by Breakmaster Cylinder.

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Lizzie Peabody: If you have a pitch for us, send us an email at [Sidedoor@si.edu](mailto:Sidedoor@si.edu).

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Lizzie Peabody: If you want to sponsor our show, please email sponsorship at [prx.org](mailto:prx.org).

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

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Diane Turnshek: The old joke comes to mind. What would you do if the world was going to end tomorrow? I'd moved to Pittsburgh. Why would you move to Pittsburgh? Because they're 10 years behind everybody else.