

But Why: A Podcast for Curious Kids

[Why Do Trains Run On Tracks?](#)

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[00:00:21] [Jane] This is *But Why: A Podcast for Curious Kids*. I'm the host of the show, Jane Lindholm.

[00:00:27] [Jane] My job is to help answer some of the really terrific questions you send us from around the world. Most of the time, Melody Bodette and I do our research and reporting from our home state of Vermont in the northeastern part of the United States.

[00:00:40] [Jane] But whenever one of us travels somewhere else, we like to take you with us. I had to go to Washington, D.C., last week for work. And so, I brought my microphone and recording equipment with me because Melody had found the perfect person to help answer some questions you've been sending us about [toot] trains.

[00:00:59] [Jane] Maybe you take underground trains known as subways – or metros – or the L – depending on what city you live in all the time. Or perhaps, you've slept on a train on an overnight trip to somewhere far away. Or maybe, like I did when I was a kid, you have a spot where you like to watch the trains full of all kinds of cargo rumble by, and you count the cars one by one until you lose track. There are lots of kinds of trains all around the world. But as I said, today we are taking your questions to the headquarters of the U.S.'s main, long-distance passenger rail service called Amtrak.

[00:01:36] [Patrick] My name is Patrick Kidd, and I'm a communications lead at Amtrak and also the in-house historian. [Jane] "In-house historian" . . . so, you know everything about trains.

[Patrick] Well, I'm trying to learn everything. I think I'll take a whole lifetime to do that.

[Jane] Can you describe where we are right now?

[00:01:49] [Patrick] We're actually sitting on an Acela Express, which is Amtrak's premium service. This is our fastest train that operates between Washington and Boston, through New York. And at its top speed, it goes 150 miles per hour.

[00:02:01] [Jane] So how long would it take to go from Washington to New York? [Patrick] From Washington to New York? I believe it's about three hours. [Jane] And if I were driving, how long would it take me in the car? [Patrick] Well, you never know. Depends on what traffic is like – right? If it's really bad traffic. . . Sometimes – you know, it's funny. Sometimes, my mom and I will go up to New York to visit my cousin. I'll take the train, and she takes the bus. I'll get there two hours before she does. You never know. [Jane] Why does she take the bus when her son works for Amtrak? [Patrick] Well, is a good question. I like to know that, too. Actually, the bus leaves close from her house, so she often hops on the bus instead of coming into town. [Jane] All right. So, our first questions are pretty basic.

[00:02:40] [Nanette] My name is Nannette, and I'm three years old. I live in Virginia. And my question is: How do trains work? [Cody] I'm Cody. I'm five years old. I'm from Portland, Oregon.

How do trains work?

[00:02:56] [Max] I am Max, and I'm five years old. And I live in Tuscaloosa, Alabama, and my question is: How do trains work?

[00:03:12] [Jane] How do trains work? [Patrick] Well, that is a good question. So, I think if you look at. . .if you've ever seen a train, or if you look at pictures of trains– you'll see that there's usually a locomotive on the train – and then it has all these cars behind it, right? So, you have two kinds of locomotives – the locomotives are what's pulling all those cars, making that train move. You have a diesel locomotive, and you have an electric locomotive – and in different parts of the country, they use different types. So, the diesel locomotive uses diesel fuel, which is kind of like the gas you might put in your car – think it was like a cousin. The electricity is like the electricity used to power the lights in your house.

[00:03:47] [Sam] I am Sam. I am four years old. I live in Chicago, Illinois. And my question is: How do how do electric trains go?

[00:03:56] [Patrick] You have an electric locomotive. If you look at the tracks, they'll have power lines up above them. We call them catenary. [Jane] Catenary. [Patrick] Catenary – that's the name for the wires that are above the tracks that carry the electric current. But they kind of look like power lines if you see them from far away. And the electric locomotives, they have this arm on the top of them called a pantograph. And the pantograph is what draws electricity from those wires down into the locomotive. And that's what drives the engine and helps to train go forward. So, when you look at those different types of trains here in the northeast between Washington and Boston, most of the Amtrak's trains are electric. Outside of the northeast, a lot of them are diesel. So, across the country every day, we're running about 300 trains a day. They carry about 87,000 people every day.

[00:04:42] [Jane] Now, if you look at old movies or cartoons, they're shoveling coal into the train. So, is that how they used to power the trains?

[00:04:49] [Patrick] That is how they used to power trains until about the 1940s, 1950s. That's when they started switching over to diesel. Then, of course, they had electric, too, at that time – by the 1930s.

[00:05:00] [Luke] My name is Luke. I live in Sandwich, Massachusetts. I'm five years old. And I wanna know how steam trains work.

[00:05:09] [Patrick] Steam trains – today, you don't really see too many steam trains around. Maybe you go to a tourist railroad or you see one in a museum. But if you've ever seen one in operation – or seen video – it's really amazing, really powerful. You'll see all that steam and smoke come out. Of course, it's called the steam engine. It runs on steam.

So, you had to create steam. So, those old locomotives, they have what we call fire boxes. And so, you might. . .so, it as a fire, right – either powered by coal or maybe wood. And then all that heat is gonna generate. . .of course, heat that heats a boiler, and the boiler has water. And just like you might have – like, a pot of water on top of the stove – it's going to generate steam, and all that steam builds up. And that's what drives the machinery that turns the wheels for that locomotive. So, sometimes we'll see if it's in operation – you'll see all the steam coming out from the locomotive, as well, as the smoke from the burning of the coal or the wood.

[00:05:59] [Jane] All right. So that answers a lot of our questions about how trains work. More specifically, there are a couple of questions we have about why and how they go on tracks. I mean, we all know that cars don't have to go on a track. They're powered sometimes by diesel, sometimes by gas, sometimes by electricity. Why do trains have to go on tracks, and how does that work and help them?

[00:06:22] [Jason] Hi, my name is Jason. I live in Stamford, Connecticut; and I'm three. My question is: Why do trains drive on the track?

[00:06:35] [Jessie] Hello, my name is Jessie. I'm five years old. Why do trains have to go on tracks?

[00:06:41] [Patrick] Well, if you are ever able to go up into a locomotive or maybe see pictures of it, you know, there's no steering wheel like you have in cars. You can't steer a locomotive to go in certain direction. It's the tracks that are really guiding that train. So, the tracks, themselves, are made up of two rails. And that's what the wheels are on. And then those two rails are tied together by what we call ties – they're usually wood or sometimes concrete. And then that whole tracks sits in a bed of crushed stone – which we call ballast. And that. . . because of how wide it is, it helps distribute the weight of the train. Because a train is really heavy – I mean, it's tons and tons, right – the locomotive and the cars. But it also guides the train. So, if the tracks go straight, the train goes straight – if the tracks curve, the train curves – but it also gives you the ability to make really long trains, too. Right? They can just guide – or be guided by – those rails.

[00:07:30] [Jane] So, is that helping to explain why we have trains in the first place? I mean, why wouldn't somebody say, "Well, it would certainly be more efficient for me to be able to get right to my house in a car. What's the point of a train?"

[00:07:42] [Patrick] Well, we have to remember, it's almost 200 years ago when they first, you know, created trains. There were no such thing as cars. They didn't exist yet for another 70, 80 years. You really didn't have rubber wheels, either. So, you had these really heavy machines. You had to figure out how to get them to go over the ground. And the track is one way again, to distribute all that weight. And think, too, about trains.

[00:08:01] [Patrick] If you've ever seen a freight train, a freight train might carry, like, coal and gravel – and even orange juice, you know, sand. You can put – like – a hundred cars

together. So, it's a lot cheaper to move all those goods by all those cars. And then you also have passenger trains, too – like Amtrak – that carry people.

[00:08:19] [Jane] So is it actually more efficient to use trains than to use trucks to carry the orange juice and sand you talked about?

[00:08:25] [Patrick] It is more fuel efficient, and it's usually easier cost, too – because you're able to carry more at one time. Sometimes you're waiting for the trains to be put together because you might carry cars from one area, and they put other goods behind it. You assemble one big train that takes it, you know, anywhere across the country. You know, for a passenger trains, we have lots of specialized cars, too. So, we have cars like coaches like we're in today. Right now, where we're sitting, it has comfy chairs we can sit in. You have cafe cars that have refrigerators and microwaves. And the coach car – you can also work. There are tables – so you can get on your computer, or you can read a book. Sometimes, I like to take a nap. They also have cars that have bedrooms. So, and those ones. . .the. . . it's really neat – it kind of goes from night to day – or day to night. You can take the chairs, and they fold down – and you put a mattress on them – and they become a bed.

[00:09:19] [Jane] People are trying to get on. And I think we're even breaking the rules because we're in the quiet car. But before we get off the train and walk to the end, I want to ask one other question. This is actually from Samarra. But Samarra is noticing something that I'm noticing right now, which is that these seats don't have any seat belts.

[00:09:43] [Samarra] I am four years old. I live in Arlington Heights, Illinois. My question is: Why don't trains have any seatbelts?

[00:09:48] [Patrick] That is a good question. And actually, if you look at trains around the world, most of them don't have seatbelts. That's because the train cars themselves are really heavy and strong. So, if they do hit something – so say, they hit a tree . . .you know, maybe there's a storm – you're really protected within that car. But I think Amtrak and other railroads around the world and across the U.S. are always interested and continuing to look at risk reduction and what might be safer. So, you never know.

[00:10:13] [Jane] I want to go back and double back on our question from Noah, because you mentioned this – that trains are really heavy. And that's puzzling some of our listeners, including Noah.

[10:23] [Noah] [I'm] seven years old, and I live [in] Billerica, Massachusetts. My question is: How can trains go so fast even though they're so heavy?

[00:10:35] Well, this'll be a good question one day when you're in high school and you have to take physics – or in college. But basically – right – you have the locomotive that provides a force – the energy to move the train cars ahead. So, sometimes in really long trains – or heavy trains – you might see more than one locomotive – might have three or four – right – to really carry all these cars. [Jane] And you're just talking about the engine

cars. Right? [Patrick] The locomotives. The locomotives have the engines inside them, whether they're diesel or electric. But once you get that train moving, you have the momentum of that movement. So, you have that – all those cars moving at high speed. Now, if you tried to stop the train, it won't just stop right away – not – even like a car, right? If you stop a car, it takes a little while for it to really come to a complete stop. So, whenever you are on a passenger train, and you start coming to the station, you'll see the train has to start slowing down – way before it gets to the station – to make sure it can come to a complete stop.

[00:11:24] [Patrick] And that's one thing to talk about – safety around railroad tracks. You know, you should always – because trains come at those high speeds and they can't stop right away – you should always look for a designated crossing if you're going to cross road tracks. Remember to look both ways 'cause trains can come in either direction, and the electric ones can be pretty quiet, too. You might not hear them. And I think one good reminder is that if you see tracks, think of trains. So always take a minute to look around your surroundings and make sure you're being safe.

[00:11:52] [Jane] As I was talking to Patrick Kidd about trains, the passengers were starting to come onto the train. And to be honest, they were looking at us a little funny, like, “Who are you two people doing an interview on this train? And this is the quiet car where you're not supposed to talk. So, I hope you guys don't talk the whole way to New York and Boston.” So, we decided to get off the train before the doors closed, and we'd be stuck all the way to New York.

[00:12:17] [Jane] When we come back, we'll talk about bullet trains that go really fast, and we'll discover a little bit of the history of train travel in the United States.

[00:12:27] [Jane] This is *But Why*. And today we're in Washington, D.C. at a big train station in the city called Union Station. At Union Station, people are always coming and going, rushing to catch the commuter rail or get on the subway – it's called the Metro in Washington – or to take a train all the way up or down the East Coast. The person we're talking to today, Patrick Kidd, works for Amtrak. Amtrak was created by the U.S. government in 1970 to make sure there was passenger rail service in the country. Passenger rail service just means trains that are designed for people – not for freight like car parts, or orange juice, or sand. These are trains that carry people all over the country. The federal government owns the majority of stock in Amtrak, which basically means the government kind of owns a lot of the company. But Amtrak is not really part of the government.

[00:13:19] [Jane] It's a private company. Patrick and I were talking on a train that goes from Washington, D.C. up to New York City and then on to Boston. Most of the time, this train goes about the speed of a car on a highway, but it doesn't have to stop for red lights like cars do. And in certain places, it goes much faster. We stepped off the train to watch it depart, and Patrick told me a little bit more about this train and other trains.

[00:13:45] [Jane] OK, so now we're walking on the train platform, right? Do I have that term right? [Patrick] That's correct. [Jane] And we're outside the train. Can you tell me anything interesting about this Acela, as you told me earlier, from the inside?

[00:13:57] [Patrick] So if you ever see the Acela, it's the most kind of streamlined train, 'cause it's our fastest train. Like I said before, it can go up to 150 miles per hour at its highest part of the route – or the fastest part of the route – between New Haven, Connecticut, and Boston. So, if you live up that way in New England, maybe you'll see the train go by you one day. They call these fixed. So, unlike another train where you could add another car, you could take a car off, these always operate as a set. So, it has coaches, and it has a cafe car that always operate together. And it has what we call power cars – which are like locomotives. There's a power car at each end of the train. So that way, when it gets to the last station, you don't have to turn the train around and take time. You can simply reverse it, and it can go right back out and come in the other direction. So, it makes a little bit faster to turn the train around and keep it running.

[00:14:51] [Jane] You mentioned that this is Amtrak's fastest train, but we have a question from Riley about even faster trains.

[00:14:57] [Riley] I'm seven years old. I live in Melbourne, Australia. And my question is: Why do bullet trains go so fast?

[00:15:05] [Jane] Bullet trains are high speed trains that can whisk passengers from one place to another at speeds of more than 200 miles an hour. Most people associate the phrase “bullet train” with Japan, where they started operating more than 50 years ago. But these days, a lot of countries have high-speed trains. China has the fastest ones. The Shanghai maglev train goes as fast as 268 miles per hour on one part of its daily service. Some high-speed trains in testing have reached nearly 400 miles an hour, but none go that fast carrying passengers on a daily basis.

[00:15:42] Patrick had some information about how these trains typically go so fast.

[00:15:47] [Patrick] Those high-speed trains – bullet trains - what really makes them fast? So, number one, they use electric power – like the Acela Express does. They're also really streamlined if you look at them. They're really smooth and rounded so they can go right through really quickly. They don't have all the air hitting them – that's keeping them – or making them go a little bit slower.

[00:16:06] [Patrick] You also see when they build high-speed trains like that, they either will build a whole new track just for the high-speed train. Or if it's an older track, they'll try and smooth out any of the old curves. They want to make it as straight as possible so the train doesn't have to slow down and start back up again. And if there are any road crossings, they'll try to close off the road crossings. Again. ..just. . . they want to keep that train moving as fast as possible, you know, at all times so, it can get to its destination.
[Jane] Why don't you have bullet trains? [Patrick] Why don't we have bullet trains? Well, I think we're working on it. You know, if we have the next generation of Acela Express that's

coming in a couple years – they're actually building the cars right now. That'll be our new flagship line. But again, we're always looking to improve the service that we provide to the American people.

[00:16:51] [Jane] Can you tell me the difference between a locomotive, a passenger car, and a caboose? Because we haven't even talked about the caboose yet, really, at least by name. And that's the most fun one to say.

[00:17:04] [Patrick] So, the locomotive is what really pulls the train, right? It has the engines inside of it, whether that's diesel or electric or steam – like we have talked about. The passenger cars are actually all of the different kinds of cars that hold people. So, whether that's a coach or a dining car or sleeping car, and then the caboose. The caboose, they really use on freight trains – but today we don't really use them. They would have been at the back of the train. That's where the crews would have sat. You could do paperwork, you know, have your meal there. But today, a lot of those functions are no longer needed on day-to-day trains. They also. . . the caboose would have had the marker lights for the end of the train to let people. . . the train behind it know that it was there. That's all been automated today – so no longer. But if you look at a caboose or maybe ever see one in a museum, you probably see it had a stove and a bathroom. It usually had like a bunk where somebody could sleep – and maybe a desk that someday could work at. It's just the changing nature of, you know, the railroad industry today.

[00:17:59] [Jane] Well, you said you were a historian – a train historian – and an Amtrak historian. So, tell us about the role that trains played in expanding America and our territory, especially out West.

[00:18:13] [Patrick] Well, they played a really important role. We just had a big anniversary about a month ago for the first transcontinental railroad.

[00:18:20] [Jane] You have to explain “transcontinental.” [Patrick] Sure. So, the transcontinental – if we look at “trans” and “continental”, it means going across the continent. And maybe that's a little bit of a misnomer because it really went about across two thirds of the continent. But it finally gave you a route, where you could go from the East Coast all the way to the West Coast.

[00:18:37] [Patrick] And that was a big improvement – because think, if you had to take a ship from the East Coast and go all way around South America – that's before the Panama Canal was built. [Jane] That would take a year. [Patrick] Take a year – or it'd take months – to get there. Right. A train might only take you – maybe a week, depending on how fast it's going – how many stops you're making, etc. So, they really hoped to link the country together. Course, we don't really have good roads at that time either. We really don't get the highways we see today until the 1950s, the 1960s – the highway system. So, the trains were the main connection for getting people to and from family – and business – and friends – and kind of adventure. I always say trains are more than just about carrying people or carrying goods. But it's also carrying ideas, right? It's taking new ideas and news out to other places. Now you think about the depot back in those 100 years ago. If you're. .

. the newspaper might come in on the train. So, that's where you're getting all the news about what's going on in the bigger cities somewhere else. And that's really a center of learning and kind of seeing what's going on in the world.

[00:19:40] [Jane] And with that, the train we were watching left the station. [Patrick] The conductors there at the end doing one final check, making sure everybody got on. He [was] just looking down the platform. [Jane] On its way north to New York – and then on to Boston. And that's where we'll get off today. There is much more to learn about trains. And if you're interested, there may be train museums near where you live. Thanks to Patrick Kidd and Kimberly Wood from Amtrak for teaching us about trains at Union Station in Washington, D.C. And thanks to Mike Koenig for the train horn sound.

[00:20:15] [Jane] If you have a question that you want *BUT WHY* to answer, send it to us. You can have an adult record you on a smartphone using one of the free recording apps that come with the phone. Tell us your first name, where you live and how old you are, and then tell us what you're wondering about. Send your questions to: questions@butwhykids.org. *But Why* is produced by Melody Bodette and me, Jane Lindholm, at Vermont Public Radio. Our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious.