But Why: A Podcast for Curious Kids

Why Are There So Many Different Languages?
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[Jane Lindholm] This is But Why: A Podcast for Curious Kids from, Vermont Public Radio.
[00:00:26] I'm Jane Lindholm. On this podcast we take questions from kids like you. And our whole job is to find answers. It's a pretty awesome job. If you have a question you'd like us to look into, [00:00:38] we'll tell you how to send it to us at the end of the episode. Now sometimes you send us questions that we've never even thought of or questions that are really silly. Sometimes you send us a great question, but we've already answered it or we've answered one that's very similar and maybe you missed it. This today is our fortieth episode and we've answered more than 175 questions. It's no wonder you've probably not heard them all. So today instead of answering new questions, we're going to go back to a few of the questions we're still hearing from you that we answered in earlier episodes. It's our frequently asked questions or F A Q episode. Here's a question that we've heard from a lot of you in recent months.

[Key] Hi, my name is Key and I'm six years old and I live in California and my questions is, Why does each country speak a different language?

[Vincent] Hi, my name is Vincent. I am eight years old. I live in Giloughby, Australia and my question is, Why is there so many different languages in the world?

[Yondalay] Hi, my name is Yondalay. I live in Victoria, South Africa. I am eight and a half years old. My question is, Why do people in different countries speak different languages?

[Avery] My name is Avery. I am seven years old. I live in South Hero, Vermont. My question is, Why can't everybody speak the same language?

[00:02:06]

[Jane Lindholm] That is such a great topic. We tackled it in one of our earliest episodes. In that episode we asked linguist John McWhorter to help us get a better understanding. A linguist is someone who studies languages. John was helping us tackle the question of who invented words and he says the earliest people probably invented words in Africa about 200,000 or 150,000 years ago.

[00:02:36]
[John McWhorter] So they would have been the ones who first came up with words for things and then they would have passed those onto their children and that would have kept going until you and me.

[00:02:46]
[Jane Lindholm] But that doesn't explain why we speak so many different languages.

[00:02:50]
[John McWhorter] Language changes all the time in the same way as the clouds in the sky are always moving. If you look up and you see the clouds looking one way today then

you don't look up tomorrow and wonder why the clouds aren't in the same places. They're always moving. Language is the same way because the sounds are always changing a little bit. If you have a bunch of people and one bunch goes in one direction and live there forever and one bunch go in a different direction and live there forever, then not only is everybody's language changing but languages change in all sorts of different ways. So if you have a word “tray” that means “tree” with one group, “tray” is going to turn into “tree”. But then in another group, “tray” might turn into something like “try” and then that becomes “trah” or something like that.

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[Jane Lindholm] It used to be that people lived apart from one another and people on one side of a mountain might never see or talk to people on the other side of a mountain. So all those languages would change or evolve independent of one another. The people on one side of the mountain might be changing in certain ways but they didn't know what was happening on the other side of the mountain. That's why there are over 7,000 languages spoken in the world today but the number of languages in the world is shrinking. Some have only a few speakers. We still have mountains of course and we still live in different places but technology like cell phones and movies and the Internet have meant that we are not as isolated as we used to be and some of the dominant languages like English and Chinese, Spanish, Hindi and Arabic are becoming more common.

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[John McWhorter] We tend to be talking more and more like each other. More and more people all the time speak English in addition to whatever other language they spoke. But after a while their kids might not speak the other languages. Their kids might just speak English. And so we have fewer and fewer languages as time goes by. Some people think that in about a hundred years we're only going to have four or five hundred languages left.

[00:05:01]
[Jane Lindholm] John McWhorter says that's too bad because languages don't just have different words, they tell you different things about the people who speak them. So if we lose language, we lose a lot of knowledge about different cultures. Be sure to check out the whole episode if you want to learn more including why our alphabet is in the order it's in. The episode is titled *Who Invented Words*. Another question we have heard a lot since we started this show is a variation on this one.

[00:05:30]
[Logan] My name is Logan. I am five years old and I am from Jericho, Vermont and my question is, How did the first person get to the world if there was no mommy and daddy?

[00:05:44]
[Jane Lindholm] We took on that mindblowing concept not so long ago with a paleo-anthropologist named Adam Van Arsdale. That's someone who studies early humans. We talked a lot about a concept called evolution, how living things change over time and how we know when the first human beings came into existence. That episode is called *Who was the First Human?* The whole episode is dedicated to that topic and we look at it from a lot of different angles so I'm not going to play any part of that back today but check it out if you're interested. We are though going to take a listen back to a couple of questions you've been asking about our bodies. The first one is about something that happens to all of us and can be really annoying (hiccupping). Dr. Laurie Racha joined us for two episodes all about our weird and wonderful bodies. And she says hiccups are a bodily function that

develop really, really early like before we're even born. But exactly why we hiccup is a little bit mysterious.

[00:06:46]
[Dr. Laurie Racha**]** One of the things that really makes sense to me is the response to hiccups after eating. So there's a nerve that actually runs on the underside of the stomach and your stomach is a little bit like, you know size wise, it's if you take your hand and you kind of make a fist, that's about the size of your stomach when there's not really a lot in it. Now when you eat food that stomach expands and gets bigger. Kind of like a balloon that you're blowing air into but this is your eating food. And when that expands it triggers that nerve that's on the underside of the stomach to say, “Oh, I'm getting expanded” and it causes this funny little contraction of the muscle in your chest, lower chest, involved with breathing called the diaphragm and it causes these hiccups. And so as you get older it's almost like the body gets more use to this. Right? That oh, okay, the stomach is kind of predictable, they're eating again, the stomach's going to get bigger and you tend to have fewer hiccups as you get older. Now many kids can have learned that they can kind of make themselves hiccup by swallowing a lot of air and that can also make you burp. Is it triggered by laughing? When you laugh, you do tend to swallow a lot of air. Laughing and crying actually both are situations where you can develop a lot of air in your stomach. And again, I think that can trigger the hiccups too. And sometimes hiccups just happen and it's not related to eating or anything else.

[00:08:25]
[Jane Lindholm] How do you get rid of hiccups? Dr. Racha recommends drinking some water and she says there's actually some evidence that having something sweet can maybe help a little bit. She says there's no proof that standing on one foot or standing on your head works and she doesn't think you could actually scare the hiccups out of someone, though that's probably the most fun for the people around you.

[Morgan] I'm Morgan and I am 10 years old and I'm from La Vernia, Texas and my question is, [00:08:54] Why do your fingers get pruney when you stay in the water for too long?

[00:08:58]
[Jane Lindholm] We just got that question from Morgan a little while ago and we've heard from a lot of others of you who've looked at your fingers and toes after a long bath or a day at the pool or the beach and wondered the same thing. That's one of the questions Dr. Racha helped us out with too.

[00:09:12]
[Dr. Laurie Racha**]** I admit I didn't know this answer when I got this question so I had to do a little research and then I found out there is no general agreement of why this occurs. There's a couple of different theories. Theories are just ideas of why this happens and so let's talk a little bit about how the skin is made up and then we'll talk about what these two theories are. So the first is that the skin, again, is made up of two kind of layers. An outer layer called the epidermis and a deeper layer called the dermis and it's the outer layer, the epidermis, that's involved with getting wrinkly in the tub. And this doesn't happen immediately. I mean as we all know, you go swimming or you go in the bathtub and usually you've been in there for 20 minutes or so and you start to notice it. So in this outer layer of the epidermis is something called keratin. And keratin’s job is to keep your skin kind of strong and together and to also keep it moist. Now keratin gets old with time too and so it can kind of die and it's in your skin and it's just kind of sitting there as these dead cells.

And when those dead cells get subjected to water, one theory is that they kind of absorb water again almost like a sponge. And as that starts to swell it forms some wrinkles. And so my next question was, well if we have skin everywhere and we have keratin in this layer of our skin everywhere, why is it just our hands and feet? And so looking at that a little bit more closely, I found out that our hands and feet are the part of our body that do the most work. And so they have the thickest layer of keratin. And so it has the greatest opportunity to swell when it's in the water. So that made a lot of sense to me and then I was reading a different theory which said that when we have wrinkly skin, our ability to pick up objects, especially when our hands are wet, is much improved. It's kind of like having good tread on your tires on a rainy day, that you don't slip and slide as much. And that this could be something that our autonomic nervous system does. And so how we explain the autonomic nervous system is it's all of the things that are being done in your body that you don't have to tell it to do. So you don't have to tell your heart to start or keep beating. You don't have to tell your body to breathe. These are all things that your body can do on its own. And so the autonomic nervous system may just sense you're in a slippery environment. It would be better for you to have better tread and may cause the skin to wrinkle.

[00:12:03]
[Jane Lindholm] You should go back and listen to the two episodes we did all about our bodies. We looked at whether yawns are contagious, why humans don't have tails, what makes us dizzy when we spin around and lots more.

(music)

[00:12:22] In this episode of *But Why*, we're listening back to some of our most popular questions that you guys keep sending us. [00:12:29] We still haven't done an episode about the big bang or about space and we get a lot of questions on those and we're thinking about doing a whole episode about trees too. Plus we want to look at why money is so important in our society. But in the meantime, we have answered questions about why plants and flowers are different colors. For that we turn to Charlie Nardozi, a garden expert here in Vermont, where we are based.

[00:12:53]
[Charlie Nardozi] Flowers have many, many different colors and the reason for all the different colors really, is flowers are an attractant. They're trying to put on a show. It's like a beauty show. It's like, “Come see me! come see me!” And so they're trying to attract the bees, the butterflies, the hummingbirds, all those insects and creatures that will pollinate them. And because certain insects, certain hummingbirds, certain butterflies, will be attracted to certain color flowers or certain kinds of flowers a certain shape flowers. So in order to make their attractiveness the most attractive for the biggest group, they try to come up with a shape and a color that can bring people to them or bring these creatures to them. They want to attract them in there so that they can have more seed and have more of their own kind of plants. Really their whole purpose in life is to make seeds so they can keep going.

[Jane Lindholm] So that purple flower is saying, “Hey butterfly! Look at me!”

[Charlie Nardozi] Yeah, “Look at me! I’m beautiful! Come over here!” and they come in and they pollinate and you get the seeds and the seeds disperse and the plant is very happy because it's like the old grandma saying, “Oh look at all my grandchildren and great grandchildren. I’ve done so well!”

[00:13:56]
[Jane Lindholm] Do you do you know what makes a plant purple and what makes another flower red? What are the different ways that colors are created within the plant?

[00:14:08]
[Charlie Nardozi] Well within the plant there are chemicals called pigments and so based on what kind of pigments you have, those are the colors that will actually kind of exhibit. So the interesting thing about pigments kind of goes into the other question I think there was about why trees and plants are green is that we know we have this visible light spectrum that you know the spectrum of light that we see is only a small spectrum of what's actually out there and within that spectrum is all the colors of the rainbow. And so certain plants will absorb certain colors and the way it works is that if it absorbs that color, we don't really see it anymore so if it absorbs blue or red we don't see that. But most plants can't absorb the color green and so that's why leaves are green because we're actually getting a reflection of that green spectrum of light back at us. And the same thing is coming true with all these different flowers so if you have a red flower it's reflecting the red back or the purple, the purple back. So the plants need those different spectrums of light to grow but they don't often absorb everything or all those spectrums. So that's where we see the different colored flowers.

[00:15:15]
[Jane Lindholm] But let's talk a little bit more about those green leaves, the ones that are on trees. How can they be green in summer and then change color in the fall? That's what happens for deciduous trees. Lots of you have sent us questions wondering about it and we talked to a forester.

[00:15:32]
[Mike Snyder] My name's Mike Snyder. Foresters are the professionals with extensive knowledge and experience about our forests and our main job is to take care of forests and to help people interact with forests in healthy and sustainable ways. We benefit so much by the leaves being green. All green plants are green because they contain a pigment which is a chemical that makes a color. The chemical is a very important part of what goes on in leaves that allows leaves to make their own food. Chlorophyll is the chemical within the leaves that not only makes it green but allows it to harvest sunlight and use that with water and minerals from the soil to make food for themselves, starches and sugars, that they use to grow and live. And really that process of photosynthesis is based on chlorophyll being formed in the leaf and when it's formed in the leaf to allow that making of one's own food, it just happens that it looks green. It is actually reflecting the green wavelengths from the sun. The sun is transmitting electromagnetic radiation onto this planet which we all receive, it's a beautiful sunny day. That sunshine has many different wavelengths of light. It's absorbing a lot of the blue and red wavelengths in the process of photosynthesis and reflecting green and that's what our eyes are picking up on and that's why it looks green to us. It's the reflected wavelengths of light from the chlorophyll within the leaf that look green to us.

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[Jane Lindholm] Okay, so the leaves are green when they're making chlorophyll. That's their food. So what's happening in the fall?

[00:17:07]

[Mike Snyder] We know a lot now about the science of fall foliage and the colors and why and how they develop. I want to be clear that we don't know everything and some of them magic and the mystery of it still exists. That said, much of the science that's been conducted right here in Vermont has helped us understand the process. Why did the leaves turn color in the fall? First, remember not all of our trees have leaves that turn color. We have some trees that are called evergreens because they remain green throughout the year. Our spruces and pines and firs and cedars, the rest of the trees, what we call hardwoods are broad-leaved trees, they don't keep their leaves on through the winter. So this is the key: as the summer turns to fall, we notice the days are getting shorter, the amount of daylight, the trees can tell time that way too and they are triggered by the shortening day lengths to say, “We've got to get ready for winter because we're going to drop our leaves”. Well they spent all summer building that leaf, creating the chlorophyll in the leaf and refreshing it on a regular basis. That's an expensive kind of machinery. And they've invested a lot in it so this is, in a way, a sort of recycling that the tree does. As the days get shorter and the tree kind of knows it's time to prepare for winter, one of the first things it does is it stops making chlorophyll. That means the green color fades and what that does is it unmasks a couple of other colors that were there all along but were overwhelmed by the green from the chlorophyll. These pigments, the carotenoids and xanthophylls, are producing yellow and orange colors and so when the chlorophyll stops being made, the green color dissipates and that kind of unmasks the yellow and orange colors. Then as the fall progresses and we get some cool nights, not freezing but cool, it triggers yet another pigment, the anthocyanin pigment, another chemical that creates the red colors that happened later as the tree is advancing towards closing down for winter. As the reds begin to develop during the fall season, another process is happening where the leaf is actually forming a boundary between where the leaf attaches to the twig and that's signaling kind of the last role for the leaf before the wind or rain might blow it or push it off the twig. The reason they want to drop the leaf is that these broad-leaved maples and beech, elm, birch and cherry, their leaves are not as tough as an evergreen leaf and can't withstand snow and ice so if they were to keep their leaves on during the winter it would really damage the plant. And again, all of it is about the tree knowing that it needs to, you know, it can't run to Florida for the winter and it wants to be as prepared as possible so it shuts down the leaf, the green color fades, the other colors emerge and then eventually the leaf falls and the tree is not dead, it's dormant. It's slowing down, it's not going to be producing any food for the winter, it's going to live on what it has stored during the summer. But the leaves for next year have all been packed away in a bud in all the different buds throughout the twigs and the next phase is next spring after a long winter when the days begin to get longer again and the temperature starts to rise, the tree says, “Time to wake up, time to get back to work” and those buds open up and leaves, new leaves, for next year emerge that were created this year, in some cases, and then they make new ones as they developed in the next spring. That's called “bud break” and when the winter ends and that buds on the trees break and new leaves emerge, there's also a period of color that happens then because it's a transition time between winter and summer and you see particularly nice red hue to those early leaves as the buds are breaking and before they green-up. So we have kind of two seasons of color. [00:21:02] The fall season of fall foliage is the most famous.

[Jane Lindholm] You can find more about leaves at the end of our episode that’s titled *Who Invented the President?* [00:21:16] One more of our most popular questions before we end today. Why is the sky blue? For an answer to that, we thought we'd go directly to NASA, the U.S. space agency, to help us. NASA has a website called *Space Place* that's all for kids. One of the people who works there is Jessica Staller Conrad and she gave us the scientific explanation for why skies are blue.

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[Jessica Staller Conrad] We see blue when we look up at the sky because of how the light from the sun interacts with our atmosphere. The atmosphere is the layer of gases that's above the earth.

[00:21:50]
[Jane Lindholm] So Jessica said it's blue because of the way the light from the sun reacts with the gases in our atmosphere. The sky above us is filled with gases that we can't see. We typically just say it's air up there. But there are many types of gases that actually make up that air or atmosphere.

[00:22:09]
[Jessica Staller Conrad] Sunlight is just plain white light. White light is actually a mixture of all the colors of the rainbow. So one thing to remember is that light is a form of energy. So when a surge of energy passes through ocean water, you see that as a wave, right? Well light energy travels in waves too [00:22:28] and that's important in understanding the color of light that we see.

[Jane Lindholm] As Jessica said, light energy travels in waves. [00:22:36] We can't see those waves like we do in the ocean but we can see the color they produce.

[Jessica Staller Conrad] For example, long, lazy low energy waves are seen as the color red while the short, choppy high energy waves are seen as blue light. When sunlight reaches the Earth's atmosphere it hits the gases and other particles that are in the air and the light that's coming from the sun scatters. The shorter, smaller waves that we talked about, the short choppy ones, are scattered more strongly than other waves. And since the blue light are those short choppy waves, the blue light is scattered most strongly, more than any of the other colors and that's why we see the blue light in the sky.

[00:23:25]
[Jane Lindholm] So what about at sunset when the sky turns red and orange and purple and all those other beautiful colors?

[Jessica Staller Conrad] As the sun sets the sun looks like it's getting lower and lower in the sky, right? [00:23:37] That's because the sun is not directly above you anymore and the sunlight is coming at you from an angle. So it means that the light waves have to pass through more of the atmosphere to reach you here on Earth. You imagine the atmosphere is a block of cheese and the sunlight is a knife. If the knife is directly above the cheese and it's cutting through, it takes only a shortcut to get through that is to the cutting board. But if the knife is at an angle it has to take a longer pass through the cheese to get to the bottom. The setting sun is like the angled knife. Light from the low setting sun must take a longer pass to get through the atmosphere and to you on Earth. That means it hits even more gases and particles on its path through the atmosphere and the more particles it's hitting, the more the blue light waves are scattering all over the place and at sunset, almost all of the blue light is scattered away. But that means that the longer wave like red and yellow light from the sunlight are passing straight through the atmosphere into your eyes.

[00:24:49]
[Jane Lindholm] Why are the blue waves being scattered away?

[00:24:52]
[Jessica Staller Conrad] Blue waves are the short, choppy high energy waves and they're more likely to hit these particles in the atmosphere and be scattered.

[00:25:03]
[Jane Lindholm] There you have it. When the sun is high in the sky above you, more blue and ultraviolet light waves are reaching your eyes. Our eyes can't really see ultraviolet so the sky looks blue. But at sunset when the light has a longer path to get to your eyes, there are more particles in the atmosphere that those blue light waves bounce off of. So they don't reach our eyes and that gives the other light waves, the reds and yellows and oranges, a chance to get to your eyes instead. There's a lot more in our *Why is the Sky Blue?* episode and if you want to know more about the science of skies and weather and get the clouds involved, you should check out our weather show. That's it for today. I hope you enjoyed the episode. If you haven't heard some of the episodes we featured, it's all new to you and if you've already listened to them, this is a refresher. I actually learned a lot going back over these answers.

[00:25:56] Now if there's a question that you would like us to try to answer that you think we haven't answered yet, send it to us. It's easy to do on a smartphone or computer. Have an adult help you record your voice. Tell us your first name and where you live and how old you are and what your question is. And then send it to *Questions* at *ButWhyKids*.org *But Why* is produced by Melody Bodette and me, Jane Lindholm, at Vermont Public Radio.

[00:26:24] Our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious.