

The Pop Ups. Stay seated. Three, two, one, ignition. Get ready for an adventure of magnificent proportion.

The Pop Ups. (Singing.) I don't know what you've been told, but we're in a golden age - so many discoveries that are jumping off the page. Wow in the world. Wow in the world. Wow in the world. Wow in the world. Wow in the world. Wow in the world. Wow in the world. Wow in the world.

The Pop Ups. With Guy and Mindy. We're on our way, Houston.

(Soundbite of crashing.)

Mindy Thomas. Where did I put it? It's not in the ball pit bathroom. Hey, Reggie!

(Soundbite of bird cooing.)

Mindy. Any luck finding it in the pickling pagoda?

(Soundbite of bird cooing.)

Mindy. Man, still nothing, huh?

(Soundbite of bird cooing.)

Mindy. Well, keep looking, buddy.

(Soundbite of bird cooing.)

Mindy. My phone has to be around here somewhere.

(Soundbite of doorbell.)

Mindy. Coming. Run, run, run, run, run, run, run. Good morning, Guy Raz.

Guy Raz. Hey, Mindy. I came as soon as I got your message in a bottle.

Mindy. Yeah, which I threw into the ocean, like, three hours ago. What took you so long?

Guy. Well, typically a message in a bottle could take as long as - wait, wait. If this was so urgent, Mindy, why didn't you just call me?

Mindy. Well, that's the problem, Guy Raz. I may or may not have lost my phone.

Guy. Again?

Mindy. Yeah, but this time I know it's around here somewhere.

Guy. Well, have you tried retracing your steps?

Mindy. Yes! Of course I have not tried retracing my steps. OK, let me think. I dolphinatelly remember having it this morning when I was scrolling through Grandma G-Force's vacation pictures on Facespace.

Guy. Then what did you do? Come on. Come on, think, Mindy!

Mindy. I don't remember.

Guy. Mindy!

Mindy. But I know it's around here somewhere. That's why I sent you that message in a bottle inviting you to come over.

Mindy. Could you just - could you just call my phone?

Guy. Yeah, sure, let me just get my phone out here.

(Soundbite of dialing).

Guy. ...Calling now.

(Soundbite of ringtone, "The Golden Age (Wow in the World podcast theme song)")

Ringtone. (Singing). I don't know...

Mindy. Oh, I hear it.

Ringtone. ...(Singing). What you've been told...

Guy. Yeah, me too.

Ringtone. (Singing). But we're in a golden age...

Mindy. But where is it coming from?

Ringtone. ...(Singing). So many discoveries...

Guy. I think it's over this way, Mindy.

Ringtone. ...(Singing). That are jumping off the page.

Mindy. No, no, no...

Ringtone. (Singing). Wow in the world.

Mindy. ...It's definitely...

Ringtone. (Singing). Wow in the world.

Mindy. ...Coming from this way.

Ringtone. (Singing). Wow in the world.

Guy. Are you sure?

Ringtone. (Singing). Wow in the world.

Guy. I swear it's...

Ringtone. (Singing). Wow in the world.

Guy. ...Coming from over here.

Ringtone. (Singing). Wow in the world.

Mindy. Nope.

Ringtone. (Singing). Wow in the...

Mindy. I'm telling you, it's...

(Soundbite of archived recording).

Mindy. Hi, thanks for calling WOW IN THE WORLD. After the beep, get ready to record.

(Soundbite of beep).

Guy. I think I'd call those inconclusive results.

Mindy. Oh, man, still no closer to finding it. And I'm usually so good at these kinds of things. If only these fleshy seashells on the side of my head were better at hearing where my phone was coming from...

Guy. Fleshy seashells?

Mindy. Ah, yeah, that's what I call my ears.

Guy. Well, Mindy, first of all, those fleshy seashells are called ears. And secondly, they do much more than just help you hear. They also help you keep your balance and stop you from falling flat on your face.

Mindy. Keep my balance? Guy Raz, you're telling me that my ears help me stay on my - whoa...

(Soundbite of crash).

Mindy. ...Feet?

Guy. That's right, Mindy. Pretty incredible, huh?

Mindy. Oh, yeah, real incredible. Now help me up.

Guy. Here you go. What's more incredible, though, is how all of the little parts of the ear come together to help you hear.

Mindy. Really?

Guy. Really. Your ear is made up of three different sections - the outer ear, the middle ear and the inner ear.

Mindy. Hm, let me see that mirror. Outer ear, middle ear. And inner ear is somewhere in there.

Guy. And all of these parts come together to help you hear what you hear.

Mindy. Like how all of those cogs, or gears, in a clock work together to help tell the time.

Guy. Exactly.

Mindy. So how exactly do our ears detect sound?

Guy. Well, I could tell you, Mindy...

Mindy. Yes?

Guy. ...Or I could show you.

Mindy. Yes! I was hoping you'd say that.

Guy. All right, all right, wait right here. I've got just the thing back at my place.

(Soundbite of door opening).

Mindy. Wait, what? Where are you go...

(Soundbite of door closing).

Mindy. I'm supposed to wait here. (Singing). I don't know what you've been told. We're in a golden age - so many emergencies are blowing off the page. Wow in the world. Wow in the world. Wow in the world. Wow in the world. Wow in the world.

(Soundbite of door opening).

Guy. Ta-daaa!

Mindy. Guy Raz, what do you have on your face? Are those ski goggles?

Guy. Nope.

Mindy. Onion-cutting goggles?

Guy. Uh uh!

Mindy. Are we playing pin the tail on your grandma?

Guy. No, Mindy. This is my new virtual reality headset. I've been meaning to find an excuse to try it out.

Mindy. Cool.

Guy. And I got one just for you. Put it on. I'll boot it up.

Mindy. OK, I'm just going to put mine over my eyes now. Guy Raz, I can't see anything. Where am I? Am I blind? Where did everybody go? What's happening to me? Can I have a sandwich?

(Soundbite of crashing).

Guy. Calm down, Mindy. I just need to boot it up. But - you ready?

Mindy. Yeah, just take me out of this darkness.

Guy. OK, here we go. Three, two, one, and here we are.

(Soundbite of booting up).

Mindy. Whoa, Guy Raz, this is bonkerballs. What am I looking at?

Guy. This, Mindy, is a giant human ear.

Mindy. Whoa.

Guy. In fact, it's my ear.

Mindy. Your ear? Guy Raz, why are we looking at a giant version of your ear?

Guy. Well, naturally, to learn how to hear.

Mindy. What?

Guy. To learn how to hear.

Mindy. What?

Guy. (Yelling). To learn how to hear.

Mindy. (Yelling). What? OK, so what's the first step?

Guy. Well, the first thing our ears do is pick up sound waves, so - here, let me just show you. I just need to fiddle with the simulation here. And perfect, here it is.

(Soundbite of clicking and start up noises).

Mindy. What in the - Guy Raz, there are sound waves everywhere. This is so cool.

Guy. Mindy, we are surrounded by sound waves all the time. And it's these sound waves that enter our ears and then get turned into electrical signals that our brain then understands as sound.

Mindy. So how does that work?

Guy. Well, these invisible sound waves are first picked up by the outer ear.

Mindy. Which is the fleshy, floppy part of the ear on the side of your head, right? - The fleshy seashell.

Guy. Stop calling it that. But, yes, that fleshy, floppy part is called the pinna. And after these sound waves enter our ears, they travel down the ear canal.

(Soundbite of electric whoosh).

Mindy. Ah, what happened?

Guy. Oh, don't worry, Mindy. All I did was transport us down to the next stage of the ear. We're still in the virtual reality simulation, remember? Don't worry.

Mindy. Oh, right, almost forgot. So, Guy Raz, what exactly is this weird, gooey stuff we're standing in right now?

Guy. Oh, that, oh, it's...

Mindy. Because it looks kind of funky.

Guy. Yeah, it's my...

Mindy. It's your what?

Guy. ...Earwax.

Mindy. Your earwax? Oh, gross. Guy Raz, I'm standing in your virtual earwax? Ah, get it off. Get it off. Get it off. So gross, so gross, so gross, so gross, so gross, so gross.

Guy. Well, it might be gross, Mindy, but earwax actually contains a bunch of different chemicals that fight off infections that might hurt the skin inside the ear.

Mindy. Oh, so sort of like how some books come with a paper book cover to keep the book from getting all messed up?

Guy. Yeah, exactly.

Mindy. Oh, OK, but still gross.

Guy. Gross but useful.

Mindy. Gross but useful, kind of like me.

(Soundbite of fart).

Guy. What?

Mindy. What?

Guy. Anyway, maybe we should just get out of here.

Mindy. Aye-aye, Captain. Where we going next?

Guy. Well, the next part of the job is to turn these sound waves into vibrations. And for that, we have to visit the eardrum.

(Soundbite of electric whoosh).

Mindy. Oh, man, you got to warn me before you do that next time.

Guy. Sorry, Mindy. But here we are. We're at the eardrum.

Mindy. Well, I guess it does kind of look like a drum. Man, I wish I'd brought my virtual drumsticks with me.

Guy. Yeah. And when the sound wave hits this piece of skin - oh, look, here comes one now.

(Soundbite of sound wave).

Mindy. Whoa.

Guy. See, watch this sound wave. It vibrates this piece of skin back and forth.

Mindy. Yeah, it's totally vibrating back and forth.

Guy. And these vibrations are then passed on through a series of tiny bones inside the ear to the last stop on our journey - the cochlea.

Mindy. Uh-oh, does this mean another jump?

Guy. Yup.

(Soundbite of electric whoosh).

Mindy. Whoa. Where are we now, Guy Raz? Is this some sort of baby pool? There's water everywhere.

Guy. Oh, this isn't water, Mindy. It's a runny mixture of sodium, calcium, chlorine, potassium and electrolytes.

Mindy. Well, whatever it is, it's dank and not in a good way. So where exactly in the ear are we now?

Guy. We're inside the cochlea. And once the vibrations reach this part of the ear, they move all of this fluid inside the cochlea, which brushes up on these fine, little hairs on the side right here.

Mindy. Oh, it's so smooth.

Guy. And when all this fluid laps up against these hairs, it's like information. And that information is turned into electrical signals that the brain can then understand as sound.

Mindy. Man, that's so wow.

Guy. But it doesn't really help you find your phone.

Mindy. Yeah, not really.

Guy. I did get to show off my virtual reality headset, though.

Mindy. Yeah, speaking of which, you think we could take these things off now?

Guy. Sure thing. Let me just shut them down.

Mindy. OK, pop this baby off. That's better.

Guy. Pretty cool, right?

Mindy. Super cool. Maybe you can make a scan of my ears later and then we can finally figure out where my phone is.

Guy. What do you mean?

Mindy. Well, the shape of your ear actually matters when it comes to how you're able to tell where a sound is coming from.

Guy. Really?

Mindy. Yeah. So I just read this crazy new study from a group of neuroscientists from the University of Montreal.

Guy. And just to be clear, neuroscientists are the type of scientists who study how the brain works, right?

Mindy. Yeah, exactly. So this team of neuroscientists were able to figure out how the sound waves bounce around the outer part of our ears.

Guy. The fleshy seashell.

Mindy. No, Guy Raz, the correct term is the pinna. So it turns out how the sound waves bounce around in your pinna also help you tell where the sound is coming from.

Guy. Whoa. So it helps you tell whether a sound is coming from above or below your head?

Mindy. Exact-oritos.

Guy. So how do they work that out?

Mindy. Oh, so this part's pretty cool. They did it using a dome made of speakers and some ear molds made out of this rubbery, plastic stuff called silicone.

Guy. And then what did they do?

Mindy. OK. So first, the scientists got a bunch of volunteers to sit in the dome of speakers. And then they played sounds through...

(Soundbite of air horn).

Mindy. ...And got them to guess which direction the sounds were coming from.

(Soundbite of duck quack).

Guy. OK.

Mindy. And then they got their volunteers to put on those rubbery silicone ear molds, which fit right in the nook of their ears.

Guy. OK.

Mindy. And when they replayed the sounds for them with these ear molds in...

(Soundbite of air horn).

Mindy. ...The volunteers had a much harder time telling whether the sound was coming from above or below them.

(Soundbite of duck quack).

Guy. So what does it all mean?

Mindy. Well, Guy Raz, it means that the shape of our ears affects how our brains are able to pinpoint or figure out where sounds are coming from.

Guy. OK. So let me see if I have this right. Because the ear mold changed how the sound waves bounced around their outer ears, that changed how those sound waves were converted into vibrations. And then that confused their brains.

Mindy. Right. But that's not even the best part.

Guy. Well, why?

Mindy. OK. So the researchers had the volunteers keep these ear molds in their ears for one whole week. And when they came back, the researchers had them do the same test again.

Guy. And what did they find?

Mindy. Well, they found that the volunteers were able to predict where the sounds were coming from just as well as they did the first time around without the molds.

Guy. Wow. So their brains were able to adapt to their new ear shapes?

Mindy. You know it, Guy Raz.

Guy. So what does it all mean, Mindy?

Mindy. Well, it means that this research might one day lead to better listening devices for people who have trouble hearing.

Guy. That's so cool, Mindy. You know, I have a friend that's been on the market for - hey, wait, Mindy. What's that in your ear?

Mindy. In my what? What are you talking about?

Guy. In your ear, Mindy. There's something in there.

Mindy. Let me see here. Oh, it's sticky.

Guy. Is it earwax?

Mindy. No, it's dolphinitely not earwax.

Guy. Is it...

Mindy. Oh, gum!

Guy. Mindy, Mindy, why do you have gum stuck in your ear? That gum is probably why you haven't been able to use your super hearing skills to find your phone, right?

Mindy. Oh, my googly-eyed cat, Guy Raz, you're right. Oh, I better get this stuff out of here.

(Soundbite of gum dislodging).

Guy. How do you feel now?

Mindy. Like a whole new person. Guy Raz, you want to try giving my phone another ring?

(Soundbite of dialing).

Guy. Sure thing.

(Soundbite of phone ringing).

Mindy. Oh, I got it. I know exactly where it's coming from this time. It's coming from the kitchen. Run, run, run, run...

Guy. Mindy, wait for me.

Mindy. ...Run, run, run, run. Got it.

Guy. Mindy, what is your...

Mindy. There you are, you crazy little phone. Never do that to me again. I've missed you so much. Mwah, mwah, mwah, mwah, mwah, mwah, mwah.

Guy. Mindy, was it in your fridge?

Mindy. Well, technically, the freezer. Earlier today, it froze up on me, so I just got so mad I threw it in there with all the other frozen stuff. But now I'm just so glad I found you again, phone...

Guy. What?

Mindy. ...Mwah, mwah, mwah, mwah.