

[MUSIC PLAYING]

- JOY DOLO:** Lord Featheringstone of Stratford upon Sussex upon Avon upon France reporting from 1762. I'm here to warn you about a danger that is going to sweep the world in the next century, something called a camera. As we all know, having a portrait is a privilege reserved for fancy schmancy rich people. We pay tons of money for the privilege of immortalizing our powdered wigs and frilly shirts as we should. These looks will stay hot for all time.
- But our sources say this camera will allow any old riffraff to take a picture and have their own portrait. It's a travesty. Our correspondent took to the streets to see how the public reacts.
- ELENA:** Yes, my Lord. I'm here at the town market to consult with the common folk, many of whom aren't wearing buckled shoes or fine ruffled silk garments. Here's what these fashion "oh no no nos" are saying.
- SPEAKER 1:** Ooh, I'd love to see my face without looking into a spoon.
- SPEAKER 2:** I've been corresponding for quite some time with a lovely lady up in the North country. She thinks I'm quite tall, and muscular, and handsome, so I'll stick with pen and paper, thank you.
- SPEAKER 3:** Wait, it can make portraits of anything? Forget me. I want pictures of my dog and my lunch. People would love to see that, right?
- ELENA:** So there you have it. This camera you speak of will be welcomed with open arms.
- JOY DOLO:** Oh, dear, dear. If we let the masses have this technology, we'll be drowning in pictures of everyone we've ever met, and the portrait artist will die starving.
- SPEAKER 4:** Think of me fondly, the poor portrait artist.
- JOY DOLO:** I'm Joy Dolo and this is *Forever Ago*, the show where we start at the beginning. And today, we want to know, where do cameras come from? And by we, I mean me and Elena.
- ELENA:** Hey!
- JOY DOLO:** Hi, Elena. How's it going?
- ELENA:** I'm well.
- JOY DOLO:** Oh, good, good. So cameras, what do you think about cameras? Do you have one?
- ELENA:** Yeah, I have it on my phone.
- JOY DOLO:** On your phone, do you use it a lot?
- ELENA:** Well, it's kind of hard because, if I'm doing something with friends, I record it or take pictures. So it depends.
- JOY DOLO:** So when you're using the camera, you usually use it with your friends.
- ELENA:** Yeah, basically, but sometimes I take pictures just to take pictures.
- JOY DOLO:** Yeah, have you ever like taken a picture of your food or anything like that?

**ELENA:** No, I don't do that. I'm not that person.

**JOY DOLO:** You think that's weird?

**ELENA:** Yeah, I think it's kind of weird. It's like, it's food. Just eat it.

**JOY DOLO:** Just eat it. Yeah, nothing going on there.

**ELENA:** Yeah.

**JOY DOLO:** What about with your family?

**ELENA:** Oh, yeah, I take pictures with my family.

**JOY DOLO:** Yeah, like when you guys go on vacation?

**ELENA:** Yeah.

**JOY DOLO:** So you use a lot with your family, with your friends. You don't take pictures of food because that's weird.

**ELENA:** That's just weird.

**JOY DOLO:** So let's imagine that the world didn't have any cameras. Or I know, it's terrifying, right?

**ELENA:** Yeah, it's terrifying.

**JOY DOLO:** How do you think that would change how you record things or how you look at things?

**ELENA:** It would be kind of weird because what if your friend moved out to California and then you couldn't take pictures? And you couldn't send them pictures or anything? That would just be sad. You wouldn't be able to see them.

**JOY DOLO:** Yeah, you wouldn't see them. Yeah, exactly it.

**ELENA:** You could maybe not even be able to recognize their face.

**JOY DOLO:** Yeah, if you didn't see them for a long time, you might even forget what they look like. I think I take it for granted that I have a phone with me at all times and that I can see my pictures instantaneously. But it wasn't that long ago that you had to buy a camera separate from your phone and you had to use film. Have you ever used a camera that needed film?

**ELENA:** My grandma had one of them, and once I was just messing around with it. So yeah, once.

**JOY DOLO:** It's cool because you could take the picture right there, but you can't see it right away, right?

**ELENA:** No, you can't see it.

**JOY DOLO:** Yeah. Film seems so low tech now, but at one point, it was exciting and new.

**ELENA:** And someone had to invent it.

**PAULINA VELASCO:** Or several someones.

**JOY DOLO:** Whoa.

**ELENA:** Woah.

**JOY DOLO:** Hey, Paulina.

**ELENA:** Hi.

**PAULINA VELASCO:** Hello.

**JOY DOLO:**

**PAULINA:** Paulina Velasco is a reporter, and we asked her here to investigate the camera and where it comes from.

**ELENA:** OK, so who invented the camera, Paulina?

**PAULINA VELASCO:** Well, before we get to the who's, we should talk about what. What exactly is a camera? How would you describe it, Elena?

**ELENA:** A camera is a device that records visual images such as photos, film, and videos.

**JOY DOLO:** You're like a walking Wikipedia page.

[LAUGHTER]

**PAULINA VELASCO:** Yeah, that's totally correct. We usually think of a camera as an instrument that records images of the world around us.

**ELENA:** Yeah.

**JOY DOLO:** Yeah.

**PAULINA VELASCO:** But it actually all got started with something that just reflected an image and didn't actually record anything yet. I'm talking about the camera obscura. Can you guess what language that's in, camera obscura?

**ELENA:** Spanish?

**JOY DOLO:** I'm. Going to guess French.

**PAULINA VELASCO:** Close, but it's Latin.

**ELENA:** Oh.

**PAULINA VELASCO:** And it means dark room. And that's what it is. It's a dark box or a very dark room with a hole in the wall that lets the tiniest pinprick of light through, and directly opposite the hole, you'll see the image of whatever you're pointing this box or camera obscura at. It's just upside down. How old do you think the camera obscura is? What's your best guess?

**ELENA:** 200 years old.

**JOY DOLO:** I'm going to say 16,000--

**ELENA:** What the?

**JOY DOLO:** --years old. It sounds-- it's a pinprick of a light going through this big box. That sounds like-- not like cavemen-ish, but it sounds like it was a long time ago.

**ELENA:** That is like cavemen.

**JOY DOLO:** Yeah.

**ELENA:** It's like dinosaurs.

**PAULINA VELASCO:** Well, no one knows exactly how old the camera obscura is, k we do know that it's over 2000 years old because that's when Chinese philosopher Mao Tse wrote the earliest known description of it. And not long after that, the Greek philosopher Aristotle used it to look at a solar eclipse.

**ARISTOTLE:** No more sunburnt eyes. I love this thing.

**PAULINA VELASCO:** Eventually, painters use it to trace things and create more realistic paintings.

**SPEAKER 4:** Nonsense. I painted this, uh, completely free hand.

**PAULINA VELASCO:** And astronomers used it to reflect the night sky onto a piece of paper.

**ASTRONOMER:** Little Dipper, you won't escape my meticulous measurements ever again.

**PAULINA VELASCO:** The camera obscura was probably the first tool we had to see the world as it is through a sort of lens and not just our regular old eyes. We could point the lens in a specific direction like that star, this flower, that fancy lady sitting for her portrait. And so we start isolating pockets of the world to better study them. Do you think the camera obscura should be considered the first camera? It has camera in the name.

**ELENA:** Well, I think I think it should be because where did we get the name camera from?

**JOY DOLO:** Right, and I mean the idea is it's a box that you can see images through.

**ELENA:** Yeah.

**JOY DOLO:** You just can't take it with you, so it seems like a camera in a way.

**PAULINA VELASCO:** Well, let's skip ahead to the 1800s. The Industrial Revolution is in full swing in Europe. Lots of people are moving from the countryside where they grew their own food and handmade their own clothes to cities where they work in factories and buy things from stores. And in a land called La France, there was a man named, wait for it, Louis Jacques Mande Daguerre.

**ELENA:** Ooh.

**JOY DOLO:** Ooh la la.

**ELENA:** Yeah, ooh la la.

**JOY DOLO:** Yes, ma'am.

**PAULINA  
VELASCO:** And Daguerre and his partner Joseph Nicephore Niepce--

**JOY DOLO:** Very nice.

**PAULINA  
VELASCO:** --figured out how to record the images projected by a camera obscura. So first, they coated a polished metal plate with chemicals that reacted to light. Then they put the plate inside a camera obscura so that the upside-down image projected right onto it. And the parts of the plate touched by light undergo a chemical reaction, and then with the help of a few more chemicals, you get an image, voila.

**JOY DOLO:** Oh.

**ELENA:** Cool.

**PAULINA  
VELASCO:** Daguerre kept working after Niepce died. He made more improvements and eventually named the invention after himself. He called it the daguerreotype. Can you imagine how people might have used this new technology?

**JOY DOLO:** Yeah, it's like-- so if you had this image of a flower--

**ELENA:** Yeah, a flower.

**JOY DOLO:** --or the things we were talking about before, you would have it on this plate. You can--

**ELENA:** A metal plate, that's kind of weird but good at the same time.

**JOY DOLO:** Yeah, but you can bring it with you, so it's like you have it.

**ELENA:** Oh, you can bring it with you like put it in your back pocket.

**PAULINA  
VELASCO:** Oh, let me just show you my metal plate here. This is my mother.

**JOY DOLO:** This metal plate is also my dog.

**PAULINA  
VELASCO:** Yeah, people loved the idea of taking pictures.

**MAN:** The avenue to my photography studio.

**PAULINA  
VELASCO:** They took pictures of themselves--

**WOMAN:** For my beau to take on his travels.

**PAULINA  
VELASCO:** --and family and friends--

**SPEAKER 2:** [SPEAKING FRENCH]

**SPEAKER 3:** [SPEAKING FRENCH]

**SPEAKER 4:** [SPEAKING FRENCH]

**PAULINA** --but even their pets.

**VELASCO:**

[DOG BARKING]

**SPEAKER 2:** Hold still you puffy little scoundrel.

**PAULINA** Early daguerreotypes show people wearing top hats and ruffles in their shirts. Some of the women wear corsets.

**VELASCO:** Suddenly, like we said, people could carry pictures of their loved ones with them. You could feel closer to family when you were far away. Can you guys imagine other ways people might have used daguerreotypes?

**JOY DOLO:** I imagine that they used it to take pictures of food.

**ELENA:** I mean, I think it's honestly a weird thing to take pictures of food, but go ahead. Be wild. Be free.

**JOY DOLO:** Maybe even for advertising.

**ELENA:** Oh yeah, advertising.

**JOY DOLO:** Like you used to-- there's this shirt that's over in this store, and it's over here, and this is what it looks.

**PAULINA** Show people those ruffles.

**VELASCO:**

**JOY DOLO:** Yeah, show off those ruffles.

**PAULINA** And also, when you think about it, it's sort of the first time that journalists could capture images. They did that in the Mexican-American war and their photos allowed people to see how horrible war was, even if they were far from the front lines.

**VELASCO:**

Now daguerreotypes were expensive and hard to use, but that would change in 1877, when the next big camera innovator came along.

Oh, sorry, actually he just texted. He's running a little late.

**JOY DOLO:** Oh, goodness. Well, I guess while we wait, how about a game of First Things First, Elena?

**ELENA:** Let's do it.

**JOY DOLO:** Let's do it. So we have a list of three things, and we'll try to guess the order they first appeared in history.

**ELENA:** Like which came first-- bicycles or tricycles?

**JOY DOLO:** Exactly, Elena. Do you want to read today's three things?

**ELENA:** Sure, here they are-- selfies, insta-cameras like a Polaroid, and photo bombs.

**JOY DOLO:** Do you know what a photo bomb is?

**ELENA:** Yeah, it's when someone's trying to take a picture, and then you come out of nowhere and barge in their picture.

**JOY DOLO:** And you barge into their picture, exactly.

**ELENA:** Yeah, you just-- yeah.

**JOY DOLO:** So if you're thinking about the order of history that all of this stuff came in, what do you think came first? What do you think is the oldest one?

**ELENA:** The insta-camera is like a Polaroid.

**JOY DOLO:** Yeah, the instant cameras. Do you know the Polaroid? Do you know what that is?

**ELENA:** Not really.

**JOY DOLO:** They were really popular when I was young. Have you ever seen those big blocks of--

**ELENA:** Oh, like the block ones?

**JOY DOLO:** Yep, and then it spits it out like a tongue, and then you shake it. So you think your first guess would be instant cameras, and then selfies or photo bombs? What do you think?

**ELENA:** I feel like they came around like the same time. Maybe photo bombs first.

**JOY DOLO:** Photo bombs? Yeah, because you have the picture, you can photo bomb it, and then, finally, they got to selfies. That makes sense. I think I would go down that road too-- a Polaroid instant camera first-- with the picture, you can do a photo bomb. And then following that is a selfie.

**ELENA:** And you can maybe even do the photo bomb before the instant cameras.

**JOY DOLO:** That's true, with a daguerreotype-- a daguerreotype bomb.

**ELENA:** A daguerreotype bomb.

**JOY DOLO:** All right, well, don't go anywhere. We'll reveal the answers after the break.

**ELENA:** *Forever Ago* will be right back.

**SPEAKER 5:** Did you know that people have been using cameras to spy for almost 100 years?

**SPEAKER 6:** I'm sick and tired of tracing these copies of top secret documents by hand. They don't pay me enough for this.

**SPEAKER 5:** The Minox camera was invented in 1936.

**SPEAKER 7:** Ooh.

**SPEAKER 6:** Wow.

**SPEAKER 7:** I'll take 12.

**SPEAKER 6:** That is a gadget.

**SPEAKER 5:** It could fit in the palm of your hand and could easily be hidden inside things, like a hollowed out hairbrush.

**SPEAKER 7:** Just going to lean over these classified maps while I casually brush my hair. Nothing weird going on here at all.

**SPEAKER 5:** As camera technology improved, engineers were able to create smaller cameras, and you better believe it, the spy cameras got even craftier.

**SPEAKER 6:** Nothing to see here fellas. Just checking my completely normal wristwatch like a normal person who's not also a handsome, daring super spy.

**SPEAKER 7:** What camera? This is just a regular old Teddy bear. I take this little guy with me everywhere.

**SPEAKER 5:** Throughout history, cameras have been disguised to look like briefcases, lighters, buttons, you name it. The CIA even developed a camera for pigeons to wear so they could conduct aerial reconnaissance. Luckily for our feathered friends, this pigeon espionage program has since been abandoned-- as far as we know.

**JOY DOLO:** I'm Joy Dolo, and this is *Forever Ago*, the show where we go way, way, way, way, way back.

**ELENA:** Before we hear about the next big camera invention, it's time to finish First Things First, the game where we put things in order. Here's the envelope with the answers, Joy.

**JOY DOLO:** Oh, this is such a big moment. Here we go. We could see what actually happened. Oh my goodness. So the oldest thing was the selfie.

**ELENA:** What?

**JOY DOLO:** Yeah, in 1839 was the first selfie.

**ELENA:** Oh my god. Wow.

**JOY DOLO:** Yeah, a guy named Robert Cornelius took a daguerreotype of himself.

**ELENA:** Really?

**JOY DOLO:** And that was an 1839 selfie.

**ELENA:** Oh, hey.

**JOY DOLO:** Yeah, exactly. So he had his own selfie on that little metal plate. But we were right about the middle, photo bomb. The photo bomb was the second one. It was a picture taken by Welsh photographer Mary Dillwyn, and we actually have a picture here. Do you want to check it out?

**ELENA:** Oh, I see the face. That's hilarious.

**JOY DOLO:** What do you see there?

**ELENA:** So it's two women sitting down, getting their picture taken. And then this guy-- his head is coming from like out of nowhere.

**JOY DOLO:** Jumping in the photo.

**ELENA:** He's like [VOCALIZES]

**JOY DOLO:** [VOCALIZES] Stealth. Yeah, so that was the second one, that 1853 photo bomb. And then last but not least, the instant camera. Awesome. Well, thanks very much for playing that was fun, huh?

**ELENA:** Yeah, it was.

**JOY DOLO:** All right. Before the break, Paulina, you mentioned some kind of a big shot camera adventure that was running a little late?

**PAULINA VELASCO:** Oh yeah-- Joy, Elena, meet George Eastman.

**GEORGE EASTMAN:** How do you do?

**JOY DOLO:** Hello, George.

**GEORGE EASTMAN:** Apologies for the tardiness-- confounded parallel parking.

**PAULINA VELASCO:** Back in George's day, in the late 1800s, things were pretty low tech. No one had cars yet.

**GEORGE EASTMAN:** Oh no, none of these newfangled horseless carriages. We had to use a carriage and a horse, and let me tell you, it was not always romantic. Horses poop a lot.

**PAULINA VELASCO:** So when George was 23 years old, he was planning a business trip to the Dominican Republic, where he wanted to buy real estate. I'll let Kathy Connor from the George Eastman Museum explain what happened next.

**KATHY CONNOR:** And that meant either buying a camera, which he did not own and most people did not own, or bringing an artist with you who could draw the property and sign his name to it so it would prove that it really existed.

**PAULINA VELASCO:** So George decided to buy a camera for \$100, which would be almost \$2,000 now.

**ELENA:** Oh, wow.

**JOY DOLO:** That's a lot of money, huh?

**ELENA:** Yeah, for a camera.

**KATHY CONNOR:** And the camera was about the size of a microwave today, and he had to buy a tripod, a big huge stand to put it on so it wouldn't move, and he had to buy a tent and all the chemistry he would need to be able to process his own pictures.

**GEORGE EASTMAN:** Yes, it was so complicated.

**PAULINA VELASCO:** George actually had to take lessons before he could use it. So for the camera, it wasn't like, point the camera, snap a pic, save it, done. You had to set up a tent, and then inside the tent, you had this big piece of glass. You also had to have something to rest this giant camera on and a bunch of chemicals.

**ELENA:** Oh my god.

**JOY DOLO:** It's a lot more work than it is now.

**ELENA:** Yeah, it looked huge.

**GEORGE EASTMAN:** Don't even get me started with those stinky chemicals. I had to mix them and spread them out on the glass, all in the dark. Confound it.

**PAULINA VELASCO:** We'll let him clean up a little. You had to do all this complicated stuff in the dark because direct sunlight would make the whole plate turn dark and ruin your picture. So you'd have to take this big piece of glass, covered up, to the camera, which is outside, take a picture, run back into the dark tent with it.

**KATHY CONNOR:** It was a very complicated, messy, wet process. And Eastman complained many times how he hated it. He poured chemicals when he was traveling on trips on his underwear, on his clothes. He ruined a lot of things because you have to throw everything out if it got the chemicals on it.

**PAULINA VELASCO:** So George decided there must be a better way.

**GEORGE EASTMAN:** I sure did. Cancel my tickets, scrap the trip-- someone needs to show the camera who's boss.

**PAULINA VELASCO:** He shut himself in his mother's kitchen to figure out how to make the whole camera process a lot easier. Elena, would you cancel a trip to a tropical island to work on an invention?

**ELENA:** Of course not. You got to go to the tropical island when you can.

**PAULINA VELASCO:** I totally agree. I don't know if I would cancel my trip either. But George spent three years in that kitchen experimenting, and then he read something really exciting. All the way across the Atlantic, a British photographer named Richard Maddox had been working on the exact same problem, and Maddox had a brilliant solution.

**GEORGE EASTMAN:** Way simpler than the runny chemicals on a glass plate method.

**PAULINA VELASCO:** Maddox invented a dry plate where the chemicals were already imbued in the plate, like kind of how you can eat cereal in a Bowl with milk sloshing around, or, if you're in a hurry, you can grab a cereal bar to eat that's dry. Makes sense?

**ELENA:** Yeah, makes sense because I love cereal bars.

**TOGETHER:** Cereal bar, cereal bar, you can eat it in your car.

**PAULINA VELASCO:** Exactly. So the cereal has the dried milk in it. You got your cereal, only in dry form.

**GEORGE EASTMAN:** What the heck is a cereal bar?

**PAULINA VELASCO:** Don't worry about it, George. The point is, dry plates are way better than wet messy ones. So George experimented with this method, and eventually, he started making loads of dry plates in a factory-- his factory, because he starts a business.

**GEORGE EASTMAN:** The Eastman Dry Plate Company, established 1881.

**PAULINA VELASCO:** But for our old boy George, that wasn't enough. I mean, do we use dry plates today?

**JOY DOLO:** No, we do not.

**ELENA:** Nope.

**JOY DOLO:** I couldn't even imagine.

**ELENA:** No thank you.

**PAULINA VELASCO:** Exactly. George wanted to make photography even easier.

**KATHY CONNOR:** And so he came up with a roll of film.

**PAULINA VELASCO:** George goes from huge piece of glass to dry plates to tiny, thin paper film. And the film worked the same as the dry plates, just way smaller-- so much more portable and easy to use and that film allowed him to invent--

**SPEAKER 8:** Make a note right now to pick up a roll or two of dependable Kodak film, the film in the familiar yellow box.

**PAULINA VELASCO:** --the Kodak camera. George made up the word itself.

**GEORGE EASTMAN:** Yes, K is my favorite letter. It seemed strong and incisive.

**ELENA:** I've never heard of anyone having a favorite letter.

**JOY DOLO:** I like J, personally.

**PAULINA VELASCO:** Anyways, the Kodak camera cost \$25 back in the day, which is more than most people earned in one whole week.

**JOY DOLO:** Goodness.

**ELENA:** Oh, god.

**PAULINA VELASCO:** Yeah, so not a lot of people could buy it. I mean, it was like, do I buy my family food for the week, or do I buy a camera?

**ELENA:** Food.

**JOY DOLO:** That's a good choice. That's a smart choice.

**ELENA:** Personally, I like food.

**GEORGE EASTMAN:** I want people to get three square meals a day, but also buy cameras, especially if they're my cameras. So in 1900, he came out with a camera called the Brownie that cost just \$1. And he did even more. In 1930, George Eastman decided--

**KATHY CONNOR:** He would give away a free camera. It was a Brownie camera to every child that turned 12 that year.

**PAULINA VELASCO:** And this was a huge deal because it was during the Great Depression. A quarter of people across the US end up losing their jobs. Lots of schools are closed, especially in the countryside. Many people didn't have enough money for food or for rent. And we have pictures of that because now we could document not only the beautiful things, but also the sad ones.

**JOY DOLO:** That's really interesting, because there's so much going on. So even just having this camera is creating jobs. And then the kids, even if they're going through whatever they're going through in the Depression, they're able to take a camera and take a picture.

**ELENA:** Yeah, they can take a picture of fun.

**JOY DOLO:** Yeah, or things that they enjoy and they can look at it later.

**PAULINA VELASCO:** And over the next 100 years, pictures change the world, really. Like in the '50s and '60s, photos show people how unfairly African-Americans are being treated, and photos let people empathize with strangers and say, hey, that's not right. And they stand up for things by protesting, and we have pictures of the protests too. And we started documenting our own lives from childhood to the golden years.

**KATHY CONNOR:** Today, every time you press a button to take a picture with your cell phone you're doing exactly what Mr. Eastman had wanted with that first camera-- making photography simple and easy not only to take, but also to share with the world.

**PAULINA VELASCO:** Believe it or not, we have George Eastman to thank for our smartphone cameras too, because there was an inventor at Kodak that brought us the first digital camera in 1975. And from there, cameras get smaller and smaller. Eventually, they end up on our phones, making it easy to take selfies we can share on Snapchat. Now more than ever pictures are everywhere, and we have quite a few people to thank for that. Now that it's easier than ever to take a picture, how do you two-- Joy, Elena, think that will change the future?

**ELENA:** Well, I mean it's easier, but the thing I don't really like about it is that people can get snooped on because of pictures and videos. And then there's Photoshop, and you can make it seem like it's really good when it's bad, or you can make it seem really bad when it's good. So that's what I don't like. But what I do like is that you can take pictures with your friends. You can record.

**JOY DOLO:** Yeah, I really like that idea of it's not just an activity you do by yourself. It's something you can share. You can share it with your friends. You can share with your family. And now, with the internet, you can put it on Facebook or Snapchat or Instagram. So it's like everyone can kind of be a part of your community. And I mean, it's a good thing, but like you were saying, it's also kind of a bad thing because--

**ELENA:** That's a bad thing. It can be.

**JOY DOLO:** It can be. Yeah, and I think part of that is if you're always in your phone, you don't actually get to connect with them face-to-face. You're connecting with them over these images or over the internet.

**ELENA:** Yeah, and I'm not saying it's bad, but I'm not saying it's good.

**JOY DOLO:** Yeah, what about you, Paulina?

**PAULINA VELASCO:** I think it's really great to take pictures, but I also like to remember to look up from my phone once in a while.

**JOY DOLO:** Yeah, something we can all keep in mind. Well, thanks so much for being with us, Paulina.

**ELENA:** Thank you.

**PAULINA VELASCO:** Thank you.

**GEORGE EASTMAN:** Fare thee well.

**TOGETHER:** Bye, George.

**JOY DOLO:** Nowadays, cameras can do so many cool things. Do you ever do anything fancy with your phone, like filters, Elena?

**ELENA:** Well, sometimes, my mom and I take pictures on Snapchat, with like, like the dog filter, and we do the face swap, and really funny videos.

**JOY DOLO:** You do the face swap?

**ELENA:** Yeah, we do the face swap.

**JOY DOLO:** You put your mom's face on your body and put your face--

**ELENA:** Basically.

**JOY DOLO:** Well, since she's your mom, can you really tell the difference, or do you guys look exactly alike?

**ELENA:** We basically look exactly alike.

**JOY DOLO:** That's so weird. Nuts. Well, what do you think cameras will be like in the future?

**ELENA:** I think that it's going to be like-- I think it's going to be so cool where you take a picture, and then you want to get the picture printed out, then you can click onto the picture, and then you'll be able to make it into a video. Like you can print out a video, put it in glass, and then pop it, and like tap it, like how you would do it like on your normal phone, and then you can watch a video, maybe.

**JOY DOLO:** That's interesting. Or like you could touch it, and it comes to life, and then you kind of control the movement of it.

**ELENA:** Yeah, so it's like if a man can go to the moon, I'm pretty sure that you can print out a video.

**JOY DOLO:** I'm pretty sure you're right. And that's exactly the kind of attitude we should have as inventors. If we can do that, we can definitely do that. Easy. We also asked our listeners what they think cameras will be like in the future.

**ELENA:** And they had a lot of ideas.

**LISTENERS:** My camera of the future, you could go inside your picture whenever you want.

You could press a button on it that, then, it prints it out as a toy, so then you have a little toy of your friends or a little toy of a tree or a little toy of anything.

Once you take a picture, you can literally display it in a holographic scenario, 3D and everything.

I think cameras will be able to transport you to any destination you want if you have a picture of it.

We could make a camera that's able to explore most of our oceans.

You are able to take pictures of ghosts and monsters and scary things, because I love scary things.

**JOY DOLO:** Now I want to tell you about some camera technology that's really incredible. It's pretty cool. It almost sounds like science fiction. It's called the Argus 2, and it uses digital cameras to help blind people see.

**ELENA:** Whoa, so like a bionic eye?

**JOY DOLO:** Exactly like a bionic eye. The Argus was created by a team of researchers at USC, led by Dr. Mark Humayun. It uses a tiny implant placed behind the eye and a digital camera, which Dr. Humayun says had to be super small.

**MARK HUMAYUN:** It couldn't be this big gigantic camera because nobody could wear it on their head or in the glasses.

**JOY DOLO:** They made special glasses for the Argus that have a tiny camera in between the lenses, right above your nose. And this camera sends the images to the implants in the eye. The Argus is designed for people with a specific type of blindness called retinitis pigmentosa. It makes people lose their sight over time. And Dr. Humayun says the device works differently for every patient.

**MARK HUMAYUN:** Some of these patients haven't seen for 50 years. So initially, it's not like putting on the glasses and hooking them up to a camera and they immediately see. It takes them a period of time to-- their brain to get used to seeing again.

**JOY DOLO:** And what people see with the Argus isn't anything like normal vision. They only see shapes and outlines of things when the lighting is just right. And there's no color.

**MARK HUMAYUN:** In the beginning, what I was seeing just didn't make any sense to me that's one of Dr. Humayun's patients, Terry Byland.

**TERRY BYLAND:** And little by little, I could see these little pinpoints of light. I thought that was pretty cool. I mean, it wasn't much to it, but it was neat to be able to see it.

**JOY DOLO:** The technology improved over time, and Terri got better at interpreting what he saw with the Argus. And he figured out that he could see things much better if there was a lot of contrast-- like a very bright thing in a very dark space, like the fireworks on the 4th of July.

**TERRY BYLAND:** I could see the vertical light go up, as they were going up in the air, and I could see it when it exploded. I got to see it all. When I saw that last year for the first time that good, I thought that just-- it really got me.

**JOY DOLO:** Terry is hopeful that the Argus will just get better and better because Dr. Humayun and his team are working on improvements all the time.

**MARK HUMAYUN:** I don't know how far the technology can go, but I'm hoping that this is just the tip of the iceberg, that, in fact, using this device, patients can actually read, recognize faces, and then watch TV, and perhaps, someday, drive. But that, right now, is not what you can do with the current device, but that's something that I hope we can do in the near future.

**JOY DOLO:** It's pretty crazy to think that without all of those ancient philosophers and astronomers experimenting with the camera obscura, we wouldn't be talking about bionic eyes today.

**ELENA:** Or without George Eastman deciding to cancel his tropical vacation.

**JOY DOLO:** Maybe one of you out there listening has an idea for the next big camera innovation.

**ELENA:** Head over to [foreverago.org](http://foreverago.org) and tell us about it.

**JOY DOLO:** *Forever Ago* is brought to you by *Brains On!* and American Public Media. It's produced by Molly Bloom, Marc Sanchez, Sanden Totten, and Elyssa Dudley. We had engineering help from Parker McDaniels and John Miller.

**ELENA:** Production help comes courtesy of Lauren D. Our fact checker is Ryan Katz.

**JOY DOLO:** We'd also like to thank Austin Crosse, Marlee [INAUDIBLE], Alyssa John Perry, and Jeffrey [INAUDIBLE]. Is there anyone you want to thank today, Elena?

**ELENA:** I would like to thank Paulina and Joy for inviting me to be on the show.

**JOY DOLO:** Oh, yeah, anytime. Hey, how about a selfie before we go?

**ELENA:** Sure.

**JOY DOLO:** 3, 2, 1--

**TOGETHER:** --cheese.

**JOY DOLO:** Bye.

**ELENA:** Bye.

[LAUGHTER]