MY WEIRD PROMPTS

Podcast Transcript

EPISODE #96

The Secret Language of Lines: The Evolution of Barcodes

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EPISODE SYNOPSIS

Ever wonder about the black lines on your chip bag or the QR code on your menu? Join Herman the donkey and Corn the sloth as they unravel the fascinating history of the barcode. It all started with a sketch in the sand and a pack of Juicy Fruit, but today, these symbols are the backbone of global commerce. Herman explains the mind-bending math of Reed-Solomon error correction—the reason a scratched QR code still works—and why these codes "disappeared" before their massive pandemic-era comeback. From the invention of the first "bullseye" code to the upcoming "Sunrise 2027" transition that will replace traditional UPCs, this episode of My Weird Prompts explores how a simple system of dots and dashes became a global language. Whether you're curious about the tiny squares on medicine bottles or why your phone suddenly became a scanner, Herman and Corn have the answers.

DANIEL'S PROMPT

Daniel

I’d love to learn more about barcodes and label symbologies beyond QR codes. When were they invented, and what’s the story behind the mathematics of Error Correction Code (ECC) used in them? Also, why did this technology seem to go quiet for a long time before its recent resurgence in mainstream use?

TRANSCRIPT

Corn

Welcome back to My Weird Prompts. I am Corn, and as a sloth, I usually like to take things slow, but today we are diving into something that is surprisingly fast and everywhere. I am joined by my brother, who is anything but slow when it comes to research.

Herman

That is right. I am Herman Poppleberry, and while I may be a donkey, I am certainly not stubborn when it comes to new data. Though, I do have some very firm opinions on today's topic. Our housemate Daniel sent us a fascinating prompt about something we see every single day but almost never actually look at. Barcodes.

Corn

Yeah, Daniel was asking about the stuff beyond just the standard QR codes we see on restaurant menus. He wanted to know where they came from, the weird math behind them, and why they seemed to disappear for a while before taking over the world again. Honestly, Herman, I always just thought they were those black lines on my bag of chips. I did not realize there was a whole world of symbology involved.

Herman

Oh, Corn, it is so much more than just lines. We are talking about the hidden language of the global supply chain. Without these symbols, modern civilization would basically grind to a halt. Imagine a grocery store clerk having to type in a serial number for every single apple and can of beans. It would be chaos.

Corn

I mean, they did that for a long time, right? People lived. It was not exactly the dark ages.

Herman

It was the dark ages of retail efficiency, Corn. The story actually starts way back in nineteen forty-eight. There was a graduate student named Bernard Silver who overheard a grocery store executive asking a dean at the Drexel Institute of Technology if there was a way to automatically capture product information at the checkout.

Corn

Nineteen forty-eight? That is way earlier than I expected. I figured it was a seventies thing.

Herman

Well, the idea was there, but the technology was not. Silver and his friend Norman Joseph Woodland started working on it. Woodland actually got the inspiration for the first barcode while sitting on a beach in Florida. He was poking his fingers into the sand and drawing dots and dashes, like Morse code. He realized that if he stretched those dots and dashes vertically, he would have thin and thick lines.

Corn

Wait, so the first barcode was basically just tall Morse code?

Herman

Exactly. But here is the thing, the first version was actually a bullseye shape, not a rectangle. They thought a circular pattern would be easier to read from any angle. They patented it in nineteen fifty-two, but they could not actually build a reader that worked well because they did not have lasers yet. They were trying to use five hundred watt light bulbs and photomultiplier tubes. It was huge, expensive, and it would practically set the groceries on fire.

Corn

Okay, that sounds like a bit of an exaggeration. Setting groceries on fire?

Herman

I am being serious, Corn. The heat from the lamps was a massive technical hurdle. It was not until the invention of the laser in nineteen sixty and then the microchip that this became viable. The first actual scan of a commercial product using the Universal Product Code, or UPC, did not happen until June twenty-sixth, nineteen seventy-four, in Troy, Ohio. It was a pack of Wrigley's Juicy Fruit chewing gum.

Corn

That is a very specific fact, Herman. But Daniel asked about why it went quiet. If it started in the seventies, why does it feel like barcodes only became a big deal recently with QR codes?

Herman

That is where I have to disagree with the premise a bit. Barcodes never went quiet. They just became invisible. From nineteen seventy-four to the early two thousands, barcodes were the backbone of every warehouse, hospital, and shipping port in the world. We just did not see them because they were on the bottom of boxes or on the back of ID cards. The reason it feels like they had a resurgence is that we shifted from one dimensional barcodes to two dimensional ones, and we finally put the readers in everyone's pockets.

Corn

I guess that makes sense. I never had a barcode scanner in my pocket in nineteen ninety-five. I just had a Tamagotchi.

Herman

Exactly. And the transition from one dimensional to two dimensional is where the math gets really beautiful. A standard one dimensional barcode, those lines you see on your chips, only holds about twenty digits of information. It is basically just a key to a database. The scanner reads the lines, looks up the number in a computer, and the computer says, oh, that is a bag of salt and vinegar chips. But a two dimensional code, like a QR code or a Data Matrix, can hold thousands of characters. It is the database.

Corn

See, that is where you lose me. How do you fit thousands of characters into a little square of black and white dots? And what happens if the code gets a little bit ripped or dirty?

Herman

That is the perfect transition to the math Daniel asked about. Error Correction Code, or ECC. It is the secret sauce of the modern barcode.

Corn

I have a feeling this is going to be a long explanation. Let us take a quick break for our sponsors first. Larry: Are you worried about the invisible rays coming off your neighbor's router? Do you feel like your thoughts are being indexed by a giant, celestial librarian? You need the Tin-Foil Turban Pro. It is not just a hat, it is a Faraday cage for your dignity. Our patented crinkle technology deflects up to ninety-nine percent of all psychic interference and most forms of low-level gossip. It is stylish, it is shiny, and it makes a satisfying rustling sound whenever you nod in agreement. Do not let them download your dreams while you sleep. The Tin-Foil Turban Pro is one size fits most, and if it is too big, you can just fold it into a swan. Larry: BUY NOW!

Corn

Thanks, Larry. I think. Anyway, Herman, you were about to explain the math of how these things actually work without, you know, breaking if they get a scratch on them.

Herman

Right. So, when you look at a QR code, you are not just looking at the data itself. A large portion of those dots is actually redundant information. This is based on something called Reed-Solomon error correction. It was developed in nineteen sixty by Irving Reed and Gustave Solomon at the Massachusetts Institute of Technology Lincoln Laboratory.

Corn

Nineteen sixty? These guys were way ahead of their time.

Herman

They really were. The math is based on polynomials over finite fields. Now, before your eyes glaze over, Corn, think of it like this. Imagine you are sending a message to a friend, but you know that some of the words might get smudged in the mail. Instead of just sending the sentence, you send the sentence plus a bunch of mathematical clues about the sentence.

Corn

Like a puzzle?

Herman

Sort of. Imagine I tell you three numbers: two, four, and six. The rule is that each number is two more than the last. If the middle number gets smudged and you can only see two and six, you can use the rule to figure out that the missing number must be four. Reed-Solomon math is a much more complex version of that. It treats the data as points on a curve. Even if you lose thirty percent of the dots in a QR code, the scanner can use the remaining points to reconstruct the entire curve and fill in the missing data.

Corn

Thirty percent? That is a lot. I could literally put a sticker over a third of a QR code and it would still work?

Herman

In many cases, yes. It depends on the level of error correction the creator chose. There are four levels: L, M, Q, and H. Level H can handle up to thirty percent damage. This is why you see companies putting their logos in the middle of QR codes. They are intentionally damaging the data, knowing the math will fix it on the fly.

Corn

That feels like a bit of a gamble. Why would you purposefully break the code just to put a little bird or a camera icon in the middle?

Herman

Because it looks better for branding, and the math is incredibly robust. But here is where I think Daniel's question about the quiet period gets interesting. While the math was perfected in the sixties and used by NASA to send photos back from Mars and the Voyager missions, it did not hit the mainstream consumer market because we lacked the processing power in a handheld format.

Corn

But we had barcodes in the grocery store in the seventies. Why couldn't we have QR codes then?

Herman

Because a grocery store scanner is a laser. It just sweeps a single line of light across the bars. To read a two dimensional code, you need an image sensor. You need a camera. And more importantly, you need a computer fast enough to perform those Reed-Solomon calculations instantly. In nineteen ninety-four, when Denso Wave, a subsidiary of Toyota, invented the QR code, they did it because they needed to track car parts. They had specialized, expensive scanners. It took another twenty years for the cameras in our phones to be good enough and our processors to be fast enough to do that math in milliseconds.

Corn

Okay, but I remember around ten years ago, everyone was saying QR codes were dead. There were even blogs dedicated to how useless they were. People would put them on billboards where you could not even reach them with a phone. It felt like a failed fad.

Herman

I disagree that it was a failed fad. It was a premature technology. The software was clunky. You had to download a separate app just to scan a code. It was a terrible user experience. The real resurgence happened when Apple and Google finally built the scanner directly into the phone's camera app around twenty-seventeen and twenty-eighteen. Suddenly, the friction was gone. And then, of course, the pandemic in twenty-twenty made touchless menus a necessity.

Corn

I still think the pandemic is the only reason they are back. If we didn't have to worry about touching paper menus, we'd probably have moved on to something else by now.

Herman

I don't know about that, Corn. QR codes are being used for way more than just menus now. They are used for two factor authentication, for making payments in places like China and India, and for tracking the entire lifecycle of a product. There is a new standard called the Digital Link that is going to replace the traditional UPC barcode on every product in the next few years.

Corn

Wait, the lines are going away?

Herman

Eventually, yes. The industry is moving toward a single 2D code that can be scanned by the cashier for the price, but also scanned by you, the consumer, to see the nutritional info, the origin of the ingredients, or even if there is a recall. It is called Sunrise twenty-twenty-seven. By the year twenty-twenty-seven, retailers are expected to be able to scan 2D barcodes at the point of sale.

Corn

That sounds like a lot of work for a grocery store. Are they really going to update every single scanner in the world just so I can see where my lettuce came from?

Herman

They are already doing it. It saves them money on labeling and inventory. But Daniel also asked about other symbologies. It is not just QR codes. Have you ever seen those tiny, dense squares on the back of a prescription bottle?

Corn

The ones that look like static on an old TV?

Herman

Exactly. That is usually Data Matrix. It is even more space efficient than a QR code. It can be scaled down to basically microscopic sizes. They use lasers to etch them directly onto surgical instruments or even individual computer chips. There is also Aztec code, which you often see on airline boarding passes. It has a single square in the middle instead of the three squares in the corners like a QR code.

Corn

Why are there so many different ones? Why can't we just pick one and stick with it?

Herman

Because they are optimized for different things. QR codes are great for being scanned quickly from a distance by a phone. Data Matrix is better for tiny spaces where you need high reliability. Aztec code is designed to be readable even if the image is low resolution or distorted, which happens a lot with printed paper tickets. Each one is a different mathematical solution to the problem of how to move data from the physical world into the digital world.

Corn

It is weird to think about how much math is just sitting on a cereal box. But Herman, what about the privacy side of this? If every product has a unique 2D code, does that mean companies can track exactly which box of cereal I bought?

Herman

That is a valid concern, and it is something people are debating. With a standard UPC, every box of a specific brand of cereal has the same code. But with 2D codes, they could technically give every single box a unique serial number. They could track it from the factory to the store to your house.

Corn

See, that is where it gets creepy. I do not want my cereal box reporting back to headquarters about how fast I am eating my breakfast.

Herman

Well, the box itself isn't reporting anything. It is passive. But if you scan it to get a coupon or a recipe, you are potentially giving them data. This is why understanding the technology is important. It is not just a shortcut to a website; it is a data exchange.

Corn

So, what are the practical takeaways here for the average person? Besides not setting our groceries on fire with five hundred watt bulbs.

Herman

First, realize that the black and white patterns you see are incredibly resilient. If you have a package that is damaged, as long as a good portion of that barcode is visible, a modern scanner can probably still read it. Second, for people who want to organize their homes, you can actually generate your own QR codes for free. I have been putting them on the storage bins in our basement. I scan the code, and it tells me exactly what is inside without me having to open the lid.

Corn

Oh, so that is why our basement looks like a high tech warehouse now. I thought you were just being extra.

Herman

I am being efficient, Corn. And third, keep an eye out for the transition. Over the next two years, you are going to see those traditional lines start to disappear and be replaced by these little squares. It is the biggest change in retail since the nineteen seventies.

Corn

I think I prefer the lines. They are classic. They have a certain aesthetic. These squares just look like digital noise.

Herman

Aesthetics aside, the squares are objectively better. They hold more data, they are harder to break, and they connect the physical item to the internet. It is the bridge to the internet of things.

Corn

I don't know, Herman. Sometimes I just want a box of crackers to be a box of crackers, not a bridge to the internet.

Herman

It can be both. That is the beauty of it. But we should probably wrap this up. We have covered the beach sand origins, the Reed-Solomon math, and the reason why your phone is now a powerful mathematical decoder.

Corn

And we learned that Herman is trying to turn our house into a fulfillment center. Thanks for the prompt, Daniel. It was a lot more interesting than I thought it would be. If you want to dive deeper into our episodes or send us a prompt of your own, you can find us at myweirdprompts.com. We have an RSS feed for subscribers and a contact form if you want to get in touch.

Herman

You can also find "My Weird Prompts" on Spotify and all the other major podcast platforms. We really appreciate you listening to our brotherly bickering and occasional educational deep dives.

Corn

Even if Herman gets a bit too excited about polynomials.

Herman

Hey, polynomials are the reason you can scan your boarding pass at the airport, Corn. Show some respect.

Corn

I will show respect when the scanner actually works on the first try. Anyway, thanks for joining us. We will see you next time.

Herman

Goodbye everyone. Keep scanning.