

When casino owners started tracking a Russian gang that was beating slot machines around the world, the owners learned a lot about their own machines and the nature of random numbers.

KELLY MCEVERS, HOST: There are two things that most of us believe about slot machines. One, that they're based on chance. And two, if you play long enough, you're probably going to lose. But it turns out neither is always true. Nick Fountain from our Planet Money podcast has the story of a crew of slot machine cheaters who figured this out. **NICK FOUNTAIN, BYLINE:** Ron Flores has worked in casino surveillance for 22 years at Pechanga Casino in Southern California. And in those years, he's seen a lot of different slot machine cheats. **RON FLORES:** Well, it went from fast feeding... **FOUNTAIN:** Shove quarters into the machine as fast as you can, and it would count wrong. **FLORES:** ...Stringing... **FOUNTAIN:** Tie a fishing line to a quarter, drop it in the coin slot. **FLORES:** And then you would just bounce it. **FOUNTAIN:** So you're using the same quarter over and over again? **FLORES:** Over and over again, yes. **FOUNTAIN:** Slot machine designers figured out how to counteract all these cheats years ago - limit the number of physical things that can be manipulated. So modern slot machines are basically just computers, which is why Ron Flores was so confused when he saw a new scam taking place in his casino in 2014. Average looking guy walked in, sat down at a slot machine and just won and won and won. And Ron says the guy never physically tampered with the machine, but there was something weird about the way he was playing. **FLORES:** Yeah. Every time he would put money in, and he was spinning - hitting the bet button and spinning the reels, his hand would be in a satchel. **FOUNTAIN:** Ron's best guess was that there was something in that satchel that the cheater was using to predict what was about to happen on that slot machine. And to understand how that is even possible, you have to remember that a modern slot machine is just a computer, a computer whose basic job is to generate random numbers.

LEO REYZIN: OK. Good. Let's go back to basics. Why does a slot machine need a random number generator? **FOUNTAIN:** Leo Reyzin teaches computer science at Boston University, and he says a good slot machine is impossible to predict because if you knew when it was going to hit a jackpot, that's the only time you would bet. **REYZON:** If everybody does that, then casinos aren't going to make a lot. **FOUNTAIN:** But Leo says think about what computers are good at. **REYZON:** So at a core of a computer is a processor that takes one instruction at a time and executes it. **FOUNTAIN:** In other words, computers are really good at being predictable, but Leo says being unpredictable or truly random, that's really hard. In fact, Leo doesn't even call random number generators random, he calls them pseudo-random because they look random but they're not entirely. And here's the good news. Leo says that modern pseudo-random number generators are really hard to predict. **REYZON:** Today, they take longer to crack than a few lifetimes of the universe. **FOUNTAIN:** But bad ones, like maybe the ones in the slot machines at Ron Flores's casino, those are a little easier to predict. **REYZON:** It does seem like they were exploiting a weak random number generator or weak pseudo-random number generator, to be precise, where they were looking at a pattern and realizing that they could predict the next result. **FOUNTAIN:**

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What that guy was doing at Ron Flores's casino, by the way, is against the law. Ron called up the authorities. They arrested the man. He turned out to be a Russian national.

Ron, what were you thinking at that moment? FLORES: (Laughter) I - expletive yeah. You know, we got him. FOUNTAIN: The man arrested that day was not working alone. In 2014, the Department of Justice charged three additional Russian men with conspiracy and interstate and foreign travel in furtherance of unlawful activity. They pleaded guilty and were sentenced to two years in prison. According to the Department of Justice, there have been no additional cases of slot machine cheating like this in the U.S. since the arrests. But last year in Singapore, police arrested a Czech man, a Filipino woman and four Russians for using their phones to cheat at slot machines, and that doesn't seem random. Nick Fountain, NPR News. (SOUNDBITE OF RZA AND THE BLACK KEYS SONG, "BADDEST MAN ALIVE") Copyright © 2017 NPR. All rights reserved.

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