

When The House Can't Win The Game, It Will Change The Rules

<https://mindmatters.ai/podcast/ep190/>

Robert J. Marks:

Welcome to Mind Matters News. I'm your very competitive host, Robert J. Marks. We've been talking to Sal Cordova about gambling, the algorithms of gambling, how to beat the game. And Sal has been very nice to inform us of lots of interesting things, including advantage players and people that know the system that can go in and take advantage of all the details and walk away with big bucks. We ended up last time talking about Don Johnson and how he cleaned out Atlanta. Do you know how much money he made?

Sal Cordova:

Atlantic City?

Robert J. Marks:

Atlantic City, okay.

Sal Cordova:

Oh, it's probably in the tens of millions of dollars.

Robert J. Marks:

Tens of millions of dollars.

Sal Cordova:

In the course of a few months.

Robert J. Marks:

Wow.

Sal Cordova:

Yes. He was very good at his craft.

Robert J. Marks:

And so this was a guy that came in, he used comps in order to offset his probability of loss and was able to turn that to his advantage and won tens of millions of dollars. So they had to have found him out because if I was him, I would keep on going until somebody kicked me out.

Sal Cordova:

Oh yeah. Well, probably even before they found him out, it was just... they were losing so much money. They said "We can't afford to keep this guy here." And I can't believe that this is such obvious, basic math. So the comps that he was offered was a loss rebate. So he was playing a losing game of blackjack. But his, again, going back to the law of large numbers, his loss rate was only half a percent. And they're giving him loss rebates of 10, 20%.

Robert J. Marks:

Was he card counting?

Sal Cordova:

No, no.

Robert J. Marks:

Is that right?

Sal Cordova:

He was doing what they call basic strategy, which going back to Edward Oakley Thorpe and his predecessors, they figured out if you play your hands just a certain way, so if the dealer has a certain card and you have your set of cards, in 21 what they call hit or stand, hit means you draw another card and you hope you don't go over 21. What we call busting. Or you stand where you just say, "I'm not going to take any cards." And so if you just take... In fact, the casinos will even give you the playbook. If you just ask the pit boss, they'll say, "Okay, this is the right way to play it."

Robert J. Marks:

It's a publication they give you.

Sal Cordova:

Yeah. It's just like a little index card with all the proper plays.

Robert J. Marks:

Do they give you probabilities with them?

Sal Cordova:

No, they'll just say this is the optimal way.

Robert J. Marks:

That's the best way to do it.

Sal Cordova:

So if the dealer has this card, you play it. And I said, "That's really nice of them." But you see that's...(laughs)

Robert J. Marks:

So you still end up losing. If I remember right from a freshly shuffled deck, your loss is what? In blackjack.

Sal Cordova:

It's on average about half a percent if you use this optimal strategy that even the casinos will give you. Now, you think that they're being nice. One thing the casinos realized is you don't want to... There's an old saying, you can share the sheep many, many times. You can only skin him once.

Robert J. Marks:

I'd never heard that. That's a good one. Okay.

Sal Cordova:

So they don't... the way they realize that they could get repeat customers is if you don't hurt them too bad. You let them have some good times, they'll keep coming, they'll be repeat customers, it'll add to the atmosphere of the casino. And you want to see people looking happy. You don't want to have all these sad faces there and they keep coming back. So they realized not gouging them is a good way. So again, you can shear a sheep many times, you can only skin them once you don't want to skin them. So what Don Johnson was doing, he was just playing basic strategy. And so at least from the standpoint of whether they're dealing with an advantage player, superficially, he looked like he was just an average, Joe. Now he was a very good con artist. He would look like he was a loser. He did things that he made him look like a degenerate, all the girls and stuff surrounding him and just kind of his mannerisms, but he was hiring actors, so he-

Robert J. Marks:

He hired actors?

Sal Cordova:

Well, he hired actors that were adult movie actresses.

Robert J. Marks:

Oh, from porno?

Sal Cordova:

That's the reports I read.

Robert J. Marks:

That's the reports, okay.

Sal Cordova:

So he looked like a real degenerate and he acted the part real well, but he was playing just basic strategy. But it was another department that they weren't monitoring that was giving him all these loss rebates and so he cleaned them out.

Robert J. Marks:

So let me ask you this, casinos learn from their mistakes and they fix them. I understand today, they have to very carefully balance the roulette wheel. There's no more tilts. We talked about shooting craps last time and how you have to shoot craps right now where you can do no dice sliding. How did they get rid of this thing that let Don Johnson win all these big bucks?

Sal Cordova:

I think they had to lose enough money and they came to their senses, but like a lot of organizations, you have pockets of total incompetence in one department, and it's going to negate all the skill and diligence that's handled in another. And so this is what happened. The marketing department was out of sync with basically the quality controls and the accounting and just managing expectation values. And Don Johnson kind of had... somehow he sniffed that out.

Robert J. Marks:

I see.

Sal Cordova:

The marketing department was not really looking after the bottom line like they should have and someone was asleep at the wheel or asleep at the helm. But the funny thing is, I think it was multiple casinos that began to start to compete, I guess they figured, "Oh, they're doing it so we ought to do it too." And apparently they weren't too sharp, so.

Robert J. Marks:

So, I'm wondering, do they still offer comps? I think they would've gotten rid of that.

Sal Cordova:

Lost rebates like that... Well, unfortunately for advantage players, Don Johnson decided to keep making some more bucks, so he started to become a consultant to these casinos.

Robert J. Marks:

Oh, really?

Sal Cordova:

How not to do stuff like that. And so his fellow advantage players were kind of mad at him for that.

Robert J. Marks:

I see.

Sal Cordova:

So it's just funny how that-

Robert J. Marks:

It's like a hacker that gets caught, goes to work for the NSA or the FBI.

Sal Cordova:

Exactly. So this is an example of, again, like a lot of organizations they'll have pockets of competence and little pockets of incompetence and this is where it hurt the casino and an advantage player's always looking for that where someone probably in the higher ups made a really dumb mistake.

Robert J. Marks:

Looking for the weakest link.

Sal Cordova:

Right.

Robert J. Marks:

So I used to think that the game of poker was a game that involved skill until, I think it was about a year ago, a artificial intelligent program named Pluribus beat the world champions at Texas hold'em, which really surprised me. I thought there was so much psychology in the game of poker, but the fact that an algorithm could beat the world champions in Texas hold'em, which appear seemingly every year you get the same people rising to the top playing Texas hold'em, that really fascinated me that there was really minimal contribution to psychological aspects of the game. Had you heard of that?

Sal Cordova:

No, I've not heard of that. And because I don't have a poker face, people can read me really easily. I've never touched that realm at all, but there are some people that are very good at reading other people, the reactions to the hands that they've been dealt and their bluffing patterns. Actually, I know-

Robert J. Marks:

Does that surprise you too, that an algorithm-

Sal Cordova:

That actually does surprise me a lot.

Robert J. Marks:

Yeah.

Sal Cordova:

So I could only assume that the algorithm was keeping track of bluffing patterns of its opponents.

Robert J. Marks:

Yeah. I don't know the details of it, but anyway, they taught it to do it and that to me was just astonishing. Let's talk about gaming oversight. The casinos have oversight of the games and you see these casinos and they have these little black half spheres on the top which are cameras that are monitoring what's going on. What are they looking for?

Sal Cordova:

One of the first things is game protection, meaning the casinos want to make sure that their own employees are not stealing. And then like-

Robert J. Marks:

Oh, you mentioned that to me, that that's their biggest fear is that the dealers for example, are going to stick a few bucks in their pocket, right?

Sal Cordova:

Or up their sleeve and there's one case where in one casino in Tunica, Mississippi, the box man, I think they call it. It's been a long time since I've played craps.

Robert J. Marks:

Okay.

Sal Cordova:

The head of the craps table was-

Robert J. Marks:

He's called the box man?

Sal Cordova:

I think he's called the box man.

Robert J. Marks:

Okay. Last podcast, we started to make a glossary, so we're going to add that to this. Box man. Okay. He's the guy that's head of the craps table.

Sal Cordova:

I think so. And he would take these thousand dollars chips and put it in his sleeve or something, very discreetly, and then somehow he would put it in his mouth and then he would kiss an employee and transferred the chip-

Robert J. Marks:

Oh my goodness. Okay.

Sal Cordova:

His girlfriend employee. And so for a while, surveillance was having a hard time figuring out how is he-

Robert J. Marks:

Do they check dealers and box men when they come off the floor? Do you know?

Sal Cordova:

I don't think they do, so that's what the surveillance is trying to track. But he was really good at concealing where all this was going, because they were trying to see if he was pocketing it or something and just the way he... I don't know, there was some action he was doing. He might have not even touched his pocket. I think maybe he was really good at using his hands and his palm to hide it and he would maybe just put his hand up to his mouth and then consume the... put it in his mouth and they

thought, "Well, he's obviously not swallowing it or whatever," but he's exchanging it when he was giving-

Robert J. Marks:

Those chips are pretty big, they would be hard to swallow, right?

Sal Cordova:

I know. I know. So-

Robert J. Marks:

Unless you wrapped it in a meatball maybe or something.

Sal Cordova:

So, that's the first thing. That's what the cameras... Also, they try to protect the patrons in case one patron's trying to steal money from another. I do have some stories about that. Some of these ladies would come up to you and if you have a big pile of chips, they'd start to be really cozy with you and I would have to put my hands around my chips because I didn't want her stealing it.

Robert J. Marks:

Oh really? They would sneak up and slip a few chips?

Sal Cordova:

They call them rail bandits. Yeah.

Robert J. Marks:

Okay. There's another one. What is it?

Sal Cordova:

A rail bandit.

Robert J. Marks:

A rail bandit. Okay. That's a good one. Okay. A rail bandit.

Sal Cordova:

So these, and they could be women of ill repute, you really don't know and sometimes they'll cozy up or they'll try to say, "Hey, can you spare a chip here or there?" And so surveillance will be watching some of this, that's to protect the patrons and really last-

Robert J. Marks:

And do the casinos discourage you from giving stuff to these ladies, to these rail bandits?

Sal Cordova:

They try to discourage the women from being there if they figured out who they are.

Robert J. Marks:

I see. Okay.

Sal Cordova:

Yeah. Yeah. Bad for business.

Robert J. Marks:

Do they have the ability to ban people from casinos?

Sal Cordova:

Oh yes. So one of the better things actually is that they ban addicted gamblers. So some of these gamblers that enter a program to kind of be in recovery, the casinos will cooperate with each other to say, "We're going to make sure this guy doesn't get in." And one of the reasons for that... I mean, unfortunately the casinos would love them to come back, but sometimes the city or state laws say, "Okay, you can't do business in our... you can't set up a casino here unless you have a gambler's recovery type program to help them with their addictions."

Robert J. Marks:

I see.

Sal Cordova:

So the casinos will comply. It's like, "Okay, we want that license, so we'll do it even though we'd really like to just get these guys, we're going to meet them halfway." Because some of these advocacy groups will insist.

Robert J. Marks:

But how do they monitor people? Like maybe a card counter gets expelled or a gambling addict gets expelled. Do they do face recognition? Do they got a guy at the door that has memorized all these mugshots?

Sal Cordova:

They use facial recognition now.

Robert J. Marks:

They do? Just sometimes-

Sal Cordova:

And then sometimes now they will have guys just you have to present your ID and I don't know if they're scanning it now. It would be really easy now to just present your ID, scan it. Also, if you're a frequent patron, the dealers would recognize you, the staff, so-

Robert J. Marks:

But just like a card counter, you could casino hop, it seems to me.

Sal Cordova:

Until they start... they photograph you really well and then they circulate your photo, which they did to me. And it's called the surveillance information network. The acronym is SIN. So I was put... my photograph was circulated in the SIN network and one time I was in a casino in Michigan and I got axed.

Robert J. Marks:

Really?

Sal Cordova:

And I drove 300 miles and I said, "They're not going to get me there."

Robert J. Marks:

And they got you.

Sal Cordova:

I walked in, I played a little bit. And they said, "Oh, well done, Mr. Cordova." And so-

Robert J. Marks:

Oh really?

Sal Cordova:

They had me. Yeah. They had me. And I'm just like, "They're-

Robert J. Marks:

So what do they do, do they come up and tap you on the back?

Sal Cordova:

So, well, sometimes they'll be subtle like that where they don't want a physical confrontation. But if they really want you out, they'll bring security and say, they'll come and say, "Sir, may we have a word with you? We've determined that your action is too strong," or they'll say... They won't even say anything, but they'll come up and say, "Sir, may we have a word with you? Please step away from the table. You can cash your chips, but you're not welcome to come in the casino anymore."

Robert J. Marks:

I see.

Sal Cordova:

Or sometimes they'll be half nice, they'll say you're welcome to play any other game, but you can't play blackjack anymore.

Robert J. Marks:

I see.

Sal Cordova:

Now, they have these tribal casinos around the land that are run by Indian reservations.

Robert J. Marks:

Yes. Yes.

Sal Cordova:

And so they're not subject to like federal and state law. I mean, I'm sure that there's some things that the states can do, but in those cases, one time I was taken aside by the casino security and then detained. And they said, "Well, it's up to the tribal elders to decide your fate."

Robert J. Marks:

Oh my gosh. Because you're not on US land, technically.

Sal Cordova:

Exactly. I'm on the reservation. They let me go after they just kind of tried to intimidate me.

Robert J. Marks:

Did it work? Oh yeah, I would imagine. I'd be fully intimidated.

Sal Cordova:

It worried me for a little bit, but I said, "They can't..." As long as they're not going to draw their guns if I try to run away, then I didn't feel that...what they did is they took my driver's license and wouldn't return it.

Robert J. Marks:

Are you serious?

Sal Cordova:

Yeah. They said, "Can I have your ID?" And then he just ran off with it. And I said, "Okay, I could walk out the casino, but I can't drive my car back home."

Robert J. Marks:

So how'd you get your license back?

Sal Cordova:

They came back 15 minutes later and said, "Okay, we'll let you come back to the casino, but you can't play blackjack the way you're playing it." When you bet you have to bet... Your starting bet has to be this... You can't veer your bet." Because that's how you beat it is when you've calculated the odds are favorable to you, then you raise your bet. So sometimes it's very obvious if you're a card counter you start off betting \$5. Now there's one guy, I saw it in Las Vegas, this was not on the tribal casino, but this is the ideal way to play it is you're just betting the minimal amount or better yet, you're just kind of standing at the table and watching the other players bet. And when the what they call the shoe is hot, meaning it has a very high density of ACEs and tens.

Robert J. Marks:

Okay. So you got all the bad cards out of the way.

Sal Cordova:

Exactly. So this is basically the idea is seeing craps... It's independent trials, but in blackjack, the information you gather from the cards that are dealt out are telling you what's remaining in-

Robert J. Marks:

What's coming out. Yeah.

Sal Cordova:

Right, in the deck. And so if it's a hot shoe, meaning it's rich in tens and ACEs, that's the time to bet. And so this guy, he started betting \$5 at a time. By the end of the deck, he was betting \$1500. I'm just like, "Yeah, it's really obvious." He knew the odds were in his favor. It was fun to watch him play. So the countermeasure they could say is, "Well, we're going to be nice. We'll let you play blackjack, but you can't veer your bet." They call it flat betting. You have to... Whatever you start off with, you just got to keep betting that amount.

Robert J. Marks:

Now we've seen the casinos always look at the games and if they find a way of cheating, they kind of change the rules. We did that with dice sliding, with craps. Now what do they do to discourage card counting? What are some of the things that they do other than surveillance? Clearly they can do surveillance.

Sal Cordova:

Right. Yeah. So other than banning you from the game or banning you from the casino, and they're all sorts of... The softer counter measures where they'll just say "You can't veer your bet when you're there."

Robert J. Marks:

Okay.

Sal Cordova:

They changed the rules.

Robert J. Marks:

What is it normally? Is it a bet as much as you want, is there a limit that you can bet?

Sal Cordova:

Normally there's a limit because the casinos want the law of large numbers to be in their favor and so if they allowed the bets to be big, they could actually be wiped out by variance, meaning-

Robert J. Marks:

Oh, the volatility, the up and down. Yeah.

Sal Cordova:

The volatility. And that's really scary in the craps games for them, because sometimes there could be this event that might happen once every two years or three years.

Robert J. Marks:

Yeah.

Sal Cordova:

And what sometimes the players will do is they'll win and they'll just re-bet everything that they won, so they just keep doubling their bet. And if they happen to be on a streak that is typical, it could cause the casino to lose a large amount of money. So the way the casinos defend against that is to put betting limits.

Robert J. Marks:

I see.

Sal Cordova:

Because to help the law of large numbers work in their favor, but you were asking about the other things that the casinos have done to circumvent. They've changed the rules, the payouts in the game. So it used to be, if you got a blackjack, it would pay three to two. You'd basically get 50%. So if you had a \$10 bet, if you won, you'd normally get \$10. But if you happen to have a blackjack, they'll give you \$15.

Robert J. Marks:

I see. Okay.

Sal Cordova:

The first thing they did is change the payouts in some games to six-five. You can't beat that game with ordinary card counting techniques. The other thing is they've had these continuous shuffle machines where after the dealer deals out the hands, they'll put it right back in the shuffler. And so you lose all the advantage, because the idea is-

Robert J. Marks:

Oh, so the cards are returned and there's an automatic shuffle and-

Sal Cordova:

Immediately.

Robert J. Marks:

And it's a new shuffle and so it's just like a fresh deck all the time.

Sal Cordova:

Exactly.

Robert J. Marks:

And you can't card count that.

Sal Cordova:

That's correct.

Robert J. Marks:

Yeah. Okay.

Sal Cordova:

Unless you have a full table where you might be able to get kind of a little bit of an advantage because you've seen some of the cards. You don't have a very large advantage in that. Some people have tried and for the most part you don't do it. Now, the only time that I've known the continuous shuffle machines were beaten is again, because the casino made a marketing mistake. They made a marketing mistake like the loss rebates and this time it was they had too generous... The coupons were too generous. And somehow the advantage players got ahold of all these coupons and they cleaned the casinos out for millions in Macau.

Robert J. Marks:

That's fascinating. They also use multiple decks now. They used to not use multiple decks, is that right?

Sal Cordova:

You can count down multiple decks, I've done it.

Robert J. Marks:

Really?

Sal Cordova:

Yeah.

Robert J. Marks:

So how many decks can you count down? You clearly-

Sal Cordova:

Eight.

Robert J. Marks:

You can go up to eight?

Sal Cordova:

Yeah. I've counted down eight.

Robert J. Marks:

Oh my gosh. And they also do surveillance. How does that work? They watch how you play and...?

Sal Cordova:

They can watch how you play or they have a videotape of how you play and then they'll put it through a computer and say, "Okay, these are the cards that were dealt out. This is how the player is betting and the way he's playing his hand," and the computer will do an evaluation and he'll watch you play like through three shuffles, three shoes or three decks. And then they'll say, "Okay, the odds of him doing this randomly are like that." Otherwise-

Robert J. Marks:

And they do this in real time, is that right?

Sal Cordova:

No, no. Sometimes they'll just do it just through video surveillance tape. So the next time the patron comes in they can take... That's what they did to me when the tribal elders had... They reviewed the tapes and said, "This guy's too good." And so that's what happened to me. If you have something there about some of the interesting players I could share that too, because that's kind of interesting too.

Robert J. Marks:

Sure. Tell us about the interesting players.

Sal Cordova:

Well, some of them were math professors. One of them, this is you can look up the name in Wikipedia, Michael Canjar, C-A-N-J-A-R. H was a math professor at Detroit Mercy School.

Robert J. Marks:

Do you know if they made a movie about that? There was one where starring Kevin Spacey, it was a movie called 21.

Sal Cordova:

21.

Robert J. Marks:

Yeah. Was that about him?

Sal Cordova:

No, no. That-

Robert J. Marks:

No that's a different math professor.

Sal Cordova:

That was somewhat fictitious, but MIT had a big tradition starting with Ed Thorpe of all these skilled players coming. And so the movie was loosely based on kind of the true history of that MIT tradition of technical excellence. So they're good at engineering and they're also really good at the casinos. So math

professor, he won like a quarter million dollars and that's even considered not too big among the professionals, but he gave some of it-

Robert J. Marks:

Really?

Sal Cordova:

He gave a large portion to charity and there was also a Catholic priest. He had the vow of poverty. And so he used his black... He was economics MIT graduate PhD and he said, "Well, I'm doing this for the greater glory of God." And so he donated his winnings to Boston High School, which is, I think, related to Boston College.

Robert J. Marks:

I see.

Sal Cordova:

And he got their athletic centers. Now some of the other ones went on to be like hedge fund managers, like Ed Thorpe. One of them invented SMTP [inaudible 00:22:43] so he was phenomenal.

Robert J. Marks:

I don't know what S-

Sal Cordova:

In email, SMTP.

Robert J. Marks:

Oh, okay.

Sal Cordova:

Yeah. So usually some of these guys are just... They would be skilled. They had the minds that would give them advantage. I think one of the most influential would be Bill Gross. He ran a gigantic hedge fund.

Robert J. Marks:

Spell his last name.

Sal Cordova:

G-R-O-S-S.

Robert J. Marks:

Okay.

Sal Cordova:

After he got kicked out of Las Vegas, I think he had an injury and so during his convalescence, he learned how to card count. And he went to Las Vegas for a year. They kicked him out, which probably was the best thing for his career. He went on to be a trading in bonds and he had the largest bond hedge fund. I think it managed like a trillion dollars.

Robert J. Marks:

Oh geez.

Sal Cordova:

And his saying was "The way we run our hedge fund is we're just like playing blackjack every day. We're always looking for advantages." So these are some of the interesting characters. There's Russell Sands, who is a blackjack player and a backgammon player. He was the backgammon champion. He-

Robert J. Marks:

They have champions in backgammon?

Sal Cordova:

Yeah.

Robert J. Marks:

I guess... Okay. I guess that makes sense.

Sal Cordova:

I don't know that he made money off of it, but it, again, displayed... He may have made a little bit, but it displayed his skill. He teamed up with Richard Dennis. Richard Dennis is a famous futures trader. Dennis, he started out with \$400 or \$1,400, turned it into 400 million using mathematical techniques, I think he teamed up with a mathematician named Eckhart and they just made a killing. So there was a bet between him and someone else to say, "Can we actually make good futures trader or is it something that just is intuitive?" And he formed what was called the Turtles and the Turtles were... He just gave them this program of how to do futures trading, just very simple rules. And they obeyed it and they made a killing.

Robert J. Marks:

Was this after Black-Scholes?

Sal Cordova:

Yes, after Black-Scholes. And so Russell Sands was one of these, one of the Turtles, he's also a famous blackjack player. So there's some really interesting characters that have ended up being casino advantaged players. And so there's kind of a rich history even of how these guys, where they ended up post their career, after they get kicked out of the casinos. Another one was Allen Woods. He made \$2 billion in horse racing.

Robert J. Marks:

Really?

Sal Cordova:

And he had computer analysis and he just made a killing off of it. During the crash of 2008, he had all these futures... I mean, I'm sorry, options bets, on the NASDAQ market and he pulled out six weeks too early. He would've owned the NASDAQ figuratively speaking. He would've made a killing during that big meltdown. He was just six weeks off if he had held it. So there's some very good... They apply their casino skills in brick and mortar casinos and apply it to financial enterprises and some of them are quite successful.

Robert J. Marks:

That's amazing. Let me ask you this, is there still an opening for an advantage player in Vegas? If a person is smart enough, could they go in and there's still these loopholes where they could do be advantage players?

Sal Cordova:

That's a good question and I don't know the answer because it's been 12 years... No, it's been now about 10 years since I was kicked out and after I was kicked out, I went on to other things and so I haven't followed it. The last time I went into a casino was just to use the restroom on my way to one of the conferences you and I attended actually out and there in West Virginia... Or West Virginia Casino. So, I'm sorry, I don't have the answer to that.

Robert J. Marks:

Okay. So you haven't followed any other people that have gotten rich recently?

Sal Cordova:

That's correct.

Robert J. Marks:

Okay.

Sal Cordova:

That's correct. That's interesting.

Robert J. Marks:

So I would just suggest to the viewers, they could probably just look it up and if you can make money, do it.

Sal Cordova:

Yeah.

Robert J. Marks:

If you have the skill and the discipline. I would caution them that if they have the gambling types, not to go in the casino, that's the best thing you can do. That's kind of the really sad side of it. So I was on the fun side for a while, but the sad side is just seeing how it ruined so many lives and I had to kind of close my eyes to that a little bit, otherwise... Yeah. I'd probably not want to wander in.

Robert J. Marks:

That is really interesting.

Sal Cordova:

Now, since this is Mind Matters, I did want to offer one thing.

Robert J. Marks:

Sure.

Sal Cordova:

This is an interesting application of human and computer intelligence. So the computers were a big part of sometimes like, particularly in blackjack, calculating if the game was even beatable and formulating a methodology. So Dr. Thorpe is using computers for a year up there in MIT and people like it. Aberdeen proving grounds, the jet propulsion labs.

Robert J. Marks:

This is very interesting. Thorpe publishes paper, A Favorable Strategy For 21 in 1961, which was roughly around the same few years that Bernie Woodrow at Stanford used a neural network called the Adeline to play 21 and claimed, I don't know the details, but he did claim that his Adeline computer beat the theoretical maximum of winning. I don't think he did any card counting. I think it was assuming every hand was from a freshly shuffled deck, but it came out fine. Well, we've been talking to Sal Cordova and next time I want to ask you about your career in card counting and I want a tutorial on how to card count, okay?

Sal Cordova:

Okay.

Robert J. Marks:

Okay. So we'll talk to Sal some more and so until next time be of good cheer.

Announcer:

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