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PROFESSOR: OK, what we're going to do, we're going to start our story in what at the time would have been called the Northwest United States. We're in the first part of the 1800s, and we're really talking about this portion of it here. Although later on in our story, we'll actually cover this whole region here. This was a sparsely-populated, impoverished area. There were basically no roads or towns. There was lots of swamps, mountains, rivers, land transportation was very difficult.

The area was more or less under constant warfare from 1800 till about 1880. I'm talking about large scale armies in what would be called the Indian Wars, but also smaller scale raids of dozens or half a dozen people, and individual murders. It was among the poorest areas on earth.

Who lived there? Anybody know? So early 1800s, 1810, 1820 in the Northwest United States?

AUDIENCE: No one?

PROFESSOR: Anybody? No, people lived there.

AUDIENCE: People looking for gold?

PROFESSOR: Gold miners were a little bit later, but sure, they would come along. There were some Native Americans, many of them had been pushed from other places, right? The east coast Native Americans had been pushed in there. There were some Native Americans that lived there who were resisting that. There were also Natives being pushed in from the South by the people in Mexico. So we've got people being in.

How about Acadian Driftwood? Anybody here--? So the Canadian rebels, who were

French-speaking, are being pushed here by the English. Whiskey Rebellion, right? The rebellious people in the United States are being pushed out here, escaped slaves, debtors. There is an expression at the time, GTT. If you didn't want to pay your debts, you wrote GTT on your door. It meant "Gone To Texas," and you headed over here.

So we got this area full of losers, violence, very little in the way of economic resources. A few years ago, somebody did a list of the 100 wealthiest Americans of all time. And they compared it. They tried to estimate the wealth of these people and they compared it to the total size of the economy at the time. 19 of the 100 wealthiest Americans of all time were in that Northwest area in 1850, and they made their money from about 1850 to 1880.

So what happened? How did this poor economic place with no prospects for anything, the last place in the world you'd expect anybody to get rich, how did it generate such tremendous fortunes? And it isn't just money. I mean you say, OK, well, some of them struck gold or oil or something like that.

But listen to the names. It wasn't just robber barons like Rockefeller, Mellon, and Carnegie. It was great inventors like McCormick, Westinghouse, and Pullman. Innovators in other fields, such as Swift, Pulitzer, Hearst, Armor, Marshall Field. These people are household names today. I challenge anybody in this room to name any other business innovator anywhere in the world in the entire 1900s.

OK, so we got 19 of them in this little area. And we know them today, right? None anywhere else. There were some innovations in other places, but here was clearly the place where modern business was being formed. So what was it that they had? Was it something in the water? Something in the air? What did this region have that nobody else had?

AUDIENCE: Labor?

PROFESSOR: No, it was very sparsely populated. Labor was extremely expensive. And your laborers had to spend most of their time eking out subsistence living, right? It would

be very expensive to bring in food or supplies for them. No, labor was extremely expensive.

Well, I'll tell you one thing they had was they had a game called poker.

[LAUGHTER IN AUDIENCE]

All right, you're laughing. I hope you won't be laughing at the end of this. Let's go back. The first written records we have from outside this region about poker come to us from about the late 1820s and the early 1830s. It's a lot more interesting what they don't say than what they say.

One thing they don't say is, people in this region played this game called poker, and here's how it works. None of them explain the game at all. That's kind of strange, right? Somebody comes and tells you, hey, there's this game people are playing here, but they don't tell you the rules. They didn't even describe it as a game. The one thing they were very clear about is it involved transferring large amounts of money.

They also-- nobody said, oh, it's a variant of this game or that game somebody plays somewhere else. Nobody said, this is some game you might be interested in. Everybody already knew. I mean, it was-- you can read these things. It was common knowledge that people in this area played a game called poker. It was a very serious game played for very large amounts of money. It was played nowhere else. Nobody mentioned any antecedents. Nobody said it was brought in by the French or by the Indians or by the Persians or by any other group. It was just there. It was there in the area.

A couple other interesting things about this game. First of all, what we know that, far more popular than poker at any period of time, and certainly in this period as well, were standard gambling games that are played-- variants of which are played all over the world by people of all classes. Dice games, faro was very popular at the time, wheel-based chance games.

We also know though, the other kind of game people were familiar with is played by

aristocrats-- things like whist or chess-- that don't necessarily involve gambling, although they can, and involve a lot of skill. Poker was neither of the above. OK, so let's start asking, what is there about poker that was different from any game that came before it? This might give us some clue as to why this was different. What was going on here?

Ace beats king. OK, that doesn't seem like much today. That was pretty revolutionary, right? You'd go to get executed in most countries in the world in those days for saying that. And an ace was, by the way, in early poker, ace was always high. There was no such thing as a low/high ace. So that tells you something. OK, the people who made this game, they weren't monarchists, right? They were thinking a different way.

Here's another thing, though. The hand rankings are in order of rarity. The rarer the hand, the higher it ranks. And in early poker, we didn't have straights and flushes, so it's even more straightforward. But here's something kind of interesting. Here's something that changed in the game. So in the early poker up until about the 1830s, this principle that the rarer the hand, the more valuable it was was actually employed much more consistently.

So today when you compare two hands that are of the same time-- so two people each have two pair, two people each have a pair, two people each have a nothing hand. You decide the winner starting from the highest cards on down. Right, so if I have two pair and you have two pair, we first look at who has the higher highest pair. Then we look at who has the higher lowest pair if that's a tie.

But in early poker, it was reversed. And you can see if you rank it the way we do today, we've inverted our principle. Now, the more common the hand-- like ace high hands, there are 500,000 out of the 1.3 million. These are hands with no straight, no flush, no pair, no match. The ace high hands are the most common, but they rank the highest. In poker up till about, like I say, the 1830s, we ranked it by the lowest card in the hand. So you first compared your lowest card, then your second lowest. And there you see we are true to the principle that the rarer the hand, the

higher it ranks.

Can anybody see the strategic difference this makes? Why is this important? Is it just completely arbitrary? What difference does it make? Let's say we did things this way in poker. What difference would it make to the play?

What it means is aces are much less valuable. It's a lot like-- anybody here every play lowball poker? Lowball poker, your best cards don't help you. The question is, what's your worst card? You talk about a lowball hand, you talk about the highest card in my hand that makes it. You can have four great cards, and a fifth card can completely ruin it. You can ace, king, queen, jack and then a two, and you've got a two low hand, and you lose to everybody else.

In the modern poker, if you have an ace-- let's say we both have hands and neither one of us has any matches or straight or flush. If I have an ace, I have an 83% chance that I beat you. But if we rank them by low card, an ace only gives you a 56% chance of winning. An ace is much less valuable because really the difference between ace, king, queen, and jack is very little, because it's your lowest card that's going to determine how strong your hand is.

Now, the biggest point I want to make about this isn't the subtleties of a strategy when you rank hands this way. This is a game that was designed. This is a game that somebody thought about, articulated a rational principle, and did what was at the time some pretty clever mathematics to figure out the ranking. This is not a game that evolved by long tradition. This is not a game where somebody in a court sat down and wrote the rules. This is a game that somebody designed, and they designed it for a reason.

But actually, the card playing poker is pretty trivially simple, and especially straight poker. It was called straight poker at the time. The way the game was played was you were dealt a card, you had a betting round, you were dealt a second card, you had a betting around. You were dealt a third card, you had a betting round, and then that was the last round. The last two cards-- at the time, they were called the turn and the river, just like in hold 'em today-- were dealt together, and there was no

betting after the final card. I'll tell you why that's important in a bit.

Another thing about the way the betting was done is there was no ante. There was no blind in the sense we know it today. The way the betting worked-- and again, this shows some very careful design on somebody's part-- the dealer dealt the cards. The person to the dealer's left was known as the age. The age posted a stake, and they could post any, before they saw their card, their first card. They could post a stake, any amount they wanted, including zero. They didn't have to post anything.

But the rules were a little different. On the first-- and this is only on the first round. All the subsequent rounds, the betting is exactly the same as modern poker. But on the first round, you were not allowed to call the age's bet. So let's say the age bets \$1. You cannot call that. You can fold, or you can raise. And the minimum raises the amount to the minimum bet would be \$2. So this gives a lot more advantage to the age compared to somebody who posts a blind today, a blind that can be called. In a way, you can see the analogy between what the age does and what the small blind does in poker, that somebody has to double the bet in order to play. Although in modern poker, with a small blind and a big blind, someone is forced to come in and double.

The poker players at the time were very insistent. They said poker is not gambling. And the difference between poker and gambling is no one is ever forced to make a bet. You look at your cards, you voluntarily make a bet that you think has-- they wouldn't use the word at the time, but we would say now is that you think has positive expected value. The first, the blind bet, was empirically known to be a winning. It was an advantage people posted.

Now mathematically, you can show that can't be true. But psychologically and empirically, it was true, that posting the blind with other people being forced to either double or fold was empirically an advantage. Anyone else betting, they could bet if they thought they would win. They didn't have to bet if they didn't.

So let's talk about the betting in poker. There are a couple of things about it that are different from any other game that comes before. The first one is that at the end of

every betting round, everyone remaining in the hand has bet exactly the same amount of money. The hand is mark-to-market after every round. So ultimately, you're betting on who has the best hand at showdown, or who has the best surviving hand at showdown of people who haven't folded. But in between the way, at the end of every round, the game cannot continue until everyone remaining in the hand has bet the same amount.

This didn't last all that long. So by the 1840s, 1850s, we're saying there's a lot of fight against these very strict rules. People started adding antes. People started adding straights and flushes. People started adding betting after the final round of cards. People started adding all kinds of more complicated games-- draw poker, stud poker with some cards revealed. They started adding new kinds of hands. So the game starts to change a little bit.

And R.F. Foster, who was probably one of the first people to really write a comprehensive history of poker-- and this was 100 years later, really-- explained what happened. So there is this conservative, old game, scientific based on very rigid principles, that eventually evolved into the modern game. The modern game, a lot more fun to play. The modern game allows gambling, clearly. The modern game is really for a somewhat different purpose.

But so far, we've talked about the cards and we've talked about the betting. We actually haven't talked about the most revolutionary thing in poker that, again, is like no other game that came before it. Most gambling games throughout history-- and remember, gambling goes back to human prehistory. Virtually every culture has forms of gambling. But gambling is almost always done for either goods or cash. When credit was used, credit was provided by a trusted central counterparty. So somebody who organized the game might organize credit.

Poker was never played for cash, never played for goods. Poker was played for what were called at the time "poker checks." And this is a distinction that goes all the way up to about the 1980s before it finally got erased. Even as late as the 1980s when I was playing poker, there was a distinction, and people understood it. There

were two similar things that were often confused. There were checks, and there were chips. And they looked kind of similar.

A check had intrinsic value. Checks were used for cash. Casino checks were used for cash in Las Vegas. Nobody ever used cash. You just used casino chips for all your transactions. But they were also used for all different kinds of games. Chips are just markers. Chips are things you buy at the table, and you're supposed to cash them in when you leave the table. You're not even supposed to take them from the roulette table over to the craps table or something like that. So chips are just markers. They have no intrinsic value.

There is a complicated story which I'd be happy to talk to you people about sometime. The IRS came down. And some casinos, when they pushed organized crime out, they got rid of checks. So right now, there's no such thing as, a least a legal, chip with a real, intrinsic value. They're just markers. If you show up to a casino with a \$5,000 chip and you want to cash it in, they're going to ask you where you got it, prove that you bought it at a Casino or won it at a casino. If you can't, they won't give you any money for it.

But let's go back to the early 1800s. The way poker was played was with poker checks. Poker checks were markers. Often, they were made out of clay. People would make little disks out of clay, and they would put a thumb print in it. They would put some identifiable marker. The key thing is that they were identifiable to an individual. You were playing poker with money you created yourself. And if you lost, other people would have these markers, and these markers would be claims on you. If you won, you had other people's markers.

At the end of the game, people did something called ring clearing, which means, oh, OK. You played a game for a while. You've got a bunch of checks in front of you. You're going to take the checks you have from other people, you're going to trade them for your own checks back. You're going to end up with, if you were a winner, you're going to end up with a bunch of other people's checks, and suddenly a bunch of people owe you money. Or if you were a loser, other people are going to end up

with yours.

But it's a winners responsibility to collect from the losers. There's no central counterparty. There's no trusting. You play. If you don't like a guy's checks, too bad. You got some things that aren't-- maybe you can find somebody else to trade you something for them. Now what you've done is you've created a form of money. It's this credit creation that is a really essential element of early poker.

And let's talk about another financial institution from this period-- the soft money bank, otherwise called a wildcat bank. People created banks. And the way they created banks is somebody said, I have a bank, and I'm going to make loans. And I'll either print up some bank notes, some of which were extremely crude. People even used markers, twigs, old tally sticks, things like that. They used anything they could find as bank notes. Or they just kept an accounting system. If you want to spend the money, somebody has to deposit it into the bank.

If it worked, this generated a lot of economic activity. Everything was successful. The loans paid off. Deposits were honored. Everything was fine. If it didn't work, everything was worthless. If you add one feature to this, it comes what most people think of as a bank. The one feature we're missing from this bank is what? Actual money, gold. Right. Now, this is kind of an interesting dichotomy in economics.

To me, a classic bank is a soft money bank. Capital, to me, is an additional feature that gives it some credibility, right? It means two things. It means the person creating the bank is going to have some skin in the game, is going to take a loss if the whole bank collapses, if nobody ever pays back their loans. So that shows-- it's a signal to show they have some confidence. Also, the cash they put in, the capital they put in, in theory is going to help people if the bank fails. It'll pay off some portion of the losses. In practice, it never does. In practice, the people who run the banks always get their capital out before anybody else.

But a lot of the legislation on banks, a lot of the way people think about banks, is the opposite. They think about it as a classic bank is something that has 100% capital, and that fractional reserve is some kind of like little extra thing you do to a bank. But

we see, if you look again, human prehistory cultures, you see almost all cultures have some form of this self credit equation, all kinds of things-- susus, tontines, [INAUDIBLE]. All over the world, we have these kinds of things, and they were useful in the American West.

Well, poker was one of them. Poker was a way you could create a form of money, your own money. You could play a game. If you won, you picked up a lot of credit from other people, and you could use that to generate some economic activity. If you lost, other people had to employ you, right? They had to get their money back somehow. You didn't have any money. They had to find things for you to do to work in their businesses. And this is how a lot of business was created in the old west.

Now we're going to move a little forward to around the 1840s. Anyone know what this is? It is the Chicago Board of Trade. This is actually around 1900, so it wouldn't be quite so fancy back in 1840.

Futures exchanges, again, appeared in exactly the same geographic area as the game of poker about 20 years later. Nobody invented it. Suddenly, these things started popping up all over the place. A financial institution no one had ever seen before, completely unlike anything in the past, none of them outside the region, ubiquitous inside the region, and nobody said they invented it. There was something in the culture, in the way people thought, the way people did business that made this a very natural thing to do, even though it had never been done before.

And the analogies with poker are pretty obvious, right? Mark-to-market. Every day, you're betting on the price of wheat in three months, but every day you settle up so that you got the same amount of money at stake. Clearing-- again, the initial exchanges in the early days, they used ring clearing, exactly the same as poker. Later on, they went to a full clearinghouse that was a little more sophisticated and allowed people to do it.

But what's the purpose of these exchanges? What does this futures exchange do for people?

AUDIENCE: To lock in the price.

PROFESSOR: Like who? Who would want to lock in a price?

AUDIENCE: The farmers.

PROFESSOR: OK. Well, let's think about this. I'm a farmer in 1840. I'm about a two-week journey from Chicago over bad roads. Normally, I do what farmers have done since the beginning of private agriculture. They would sell to a crop buyer. I would go to the place where I buy my supplies, and there's a crop buyer who has an agent there, or that agent also comes by my farm every month or so to check out how the crops are going, because he wants to keep tabs on the crops. And also, I can lock in a price with him.

He will buy exactly my crop. He will buy whatever quantity I happen to produce. He'll agree on a price now, or he'll set the price later. Whatever I want. I deliver it. I can deliver it to him, or for a slightly lower price, he'll come and pick it up at my farm. Now let's compare that with this futures exchange, a brand new innovation that's going to make my life better. I can take a two-week journey into Chicago. I can promise to delivery set quantity of a set grade of wheat that I don't produce that I can't be sure I will have on time. I don't know the quantity I'm going to produce, but I have to specify that.

I have to put down initial margin. I don't have any cash. All my cash is tied up in my crop. Farmers only have cash after harvest. And I have to stay in Chicago every day to make mark-to-market payments, since who's growing my wheat? OK, so this makes absolutely no sense. Anytime you read a textbook and it talks about farmers using futures exchanges, you know they haven't spent half a second thinking about this. There were no farmers involved in setting up the futures exchanges.

In fact, farmers were suspicious and have often tried to have them shut down. When farmers do use futures exchanges, they almost always buy the product. They don't sell it. So let's talk about what people really use these things for. Here is the canonical trade that you can think about, what you want to understand futures

markets.

I'm a processor. All the people who set these things up-- and by the way, all the people who set these things up were poker players. I'm not kidding. Look it up, you find the name, you find all these people were poker players. I grind wheat, OK? I'm not going to use this for hedging. I can't use it for hedging, right? I buy wheat, that's true. But is my exposure to wheat going up in price or going down in price? One going up.

OK, let me tell you two stories. Story number one, there's a sudden increase in demand for wheat. There's a big war in Europe, other crops fail in other regions. The price of wheat goes way up. What happens to my business? I'm making lots of money, right? They've got to grind lots of wheat. They're bringing all the wheat in from all the [INAUDIBLE]. Everybody grinds it, there's a shortage of grinding capacity, I can raise my prices. I'm rich.

So it that way, I'm long wheat, right? Price of wheat goes up, my business goes up. Let's say-- sorry?

AUDIENCE: So you're assuming that the price of grounded wheat is directly correlated to the price of wheat?

PROFESSOR: Yes. I'm saying the price of ground wheat is what went up. And because the price of ground wheat went up, my business is more valuable. And you're exactly-- you hit the point exactly, if that's the stuff I'm selling. Now let's do a different story.

There's a crop failure in the area. Price of wheat goes way up, right? Wheat is scarce. Who wants my grinding facilities? Nobody. There's an excess of grinding facilities. I can't charge a penny. OK, so I have no natural wheat exposure. I can't hedge my wheat exposure in this futures market. Also, for the same reasons I mentioned of a farmer, it's not a convenient place to do it. It's a type and grade of wheat I don't want at a place I don't want.

Also, the price of wheat has very little do with my business. What I care about is my machinery operating properly, what's the price of fuel, what's the price of labor,

what are the regulations on the stuff, what's the equality of the stuff I'm getting. I can lock in prices with suppliers and either buyers or the flour or sellers of the wheat anytime I want. That's not the point of the futures market.

What you want to think about is I'm growing wheat. I'm going to go to a silo, a grain silo. A grain silo is a guy, he buys wheat from all over the place and he sells it to people like me. I'm going to say, OK, I want these wheat deliveries over the next three months, so much and so on these various times. I want it delivered to my grinding facility. I want exactly this type and kind of wheat. And he'll agree, and we'll settle a deal.

Now I'm going to go to the futures exchange. I've just bought a quarter's worth of wheat from the wheat silo. I'm going to go to the futures exchange, I'm going to sell a quarter's worth of wheat forward. What have I done? Well, now I have no price risk, right? Now if the price of wheat goes up or down, I don't care, because I bought it today, and I sold it three months from now. I have borrowed wheat.

Now, what could I do instead? I could borrow money. I could borrow money and buy the wheat. But then I take two price risks-- I take the price risk of the money, and remember, this is an area where there's very little money around. These futures exchanges were invented in a place where there was very little gold and silver. There wasn't a good banking system. Bank notes weren't very trustworthy. So taking the risk of money was a big risk. And also, price of wheat going up and down.

The simplest thing is just to borrow wheat, which is what I want to do. And like any business loan, I never intend to repay this. If I'm doing a business loan, say to buy machinery, I make the loan. And when the loan comes due, I borrow again to run the business. The only time I pay back my business loans is when I shut down the business and liquidate everything and pay off the creditors.

Same thing with this. I'm going to roll these futures contracts forward forever. I'm never going to take delivery. But what I've done is I've perpetually borrowed wheat. I've taken part of my business input and I borrowed it instead of buying it.

So one thing is the futures exchanges create a tremendous amount of credit. But they do something else too that's kind of interesting. Anybody here know how to take flour and turn it back into wheat? Anybody here know how to take August wheat and move it back in time to May? All right, I have something very surprising to tell you. For 175 years, the Chicago Board of Trade here has been quoting prices on both of those services.

A futures exchange quotes prices on services nobody's ever thought of. It opens tremendous scope for innovation. Let's say I want to build a bridge. And when I build this bridge, it's going to divert wheat that was going to Saint Louis. It's going to get diverted to Chicago, because now it's going to be cheaper to move it into Chicago. I can hedge that. I can sell those transportation services on the futures market by buying Chicago wheat and selling Saint Louis wheat.

I can do calendar spreads. I can do grade spreads, cleaning spreads, all of these things are a way of buying and selling all the services involved in an agricultural processing business. And this turns out to be a far more efficient way to organize things. It's got its internally generated credit. It's got far better information flows. And this is what touches off a tremendous explosion of business activity and business innovation that goes throughout the world.

Now, one of the things that's kind of strange about futures markets is they were only used for agricultural commodities. Now, granted, that was a much bigger part of the economy than it is today, but in the global economy, this was not a big deal. There were much, much more valuable commodities that never went to futures exchanges. And there were things-- commodities weren't even the most valuable things.

When things really took off is in the 1970s when people took the same idea and moved it to financial. But my story is about poker. One of the things people sometimes say is that futures evolved from to arrive contracts. Now, to arrive contracts have been around longer than we have written records. In ancient Mesopotamia in the early days, we see in the earliest writings that we can still read

today, we find that these to arrive contracts were common.

A to arrive contract says, essentially, I will sell you 10,000 bushels of wheat at \$0.50 a bushel as soon as wheat comes to the market, wheat come to the city market.

OK, it's a price guarantee. It's not a delivery guarantee. I don't tell you when you're going to get it. I don't even guarantee you will get it. I'm just saying, when it comes, this is what I will sell it you at.

The largest to arrive market in the United States was in Buffalo. OK, everybody remember all those stories about the fortunes won and lost on the Buffalo to arrive exchange, the fistfights, the corners? We had people who made their fortunes there, never went on do anything else? Exactly. To arrive contracts are run by quiet commission clerks.

Futures exchanges are populated by tough, brawling innovators who often make fortunes or lose fortunes and go on to do dramatic business activity. There's no connection between the two. Now, can anybody tell me which ones of these are poker games?

AUDIENCE: Omaha.

PROFESSOR: Sorry?

AUDIENCE: Omaha.

PROFESSOR: Omaha, Texas. Yep.

AUDIENCE: Chicago.

PROFESSOR: Chicago, yes. This one you guys might not have heard of so much, but there is a Cincinnati. It isn't played much anymore. There is no poker game called Buffalo. There is no poker game named after any place except places where, if you lose all your money in the game, drown your servers by jumping in a river, you float down to New Orleans.

Even today, poker is very, very strongly regionally-- it's a regional attitude. It's an

extraordinarily explosive innovative economic attitude, and it has never really seeped out except the place it was born. Now, that may no longer be true with internet poker. The question is, is the soul of poker alive? Internet poker has this economic innovation and freedom and self credit creation. Is this something's that's going to spread to the whole world, or has somehow poker been neutralized and, when it comes to a computer and becomes virtual, it's no longer got that soul? It's something we're going to find out in the next few years.

Now we're going to jump forward to me. I was born in the 1950s. I was raised in Seattle. And one thing you have to understand is two people can be raised in exactly the same time, exactly the same environment, and have totally different ideas of what it was like. I think most people would say, if a movie was made of my childhood, they would say, hey, that was an idyllic childhood. Your dad was a professor. You didn't have so much money that you had affluenza and were wrecking cars or things like that. But you were never embarrassed that you didn't have clothes for school, you were never hungry, anything like that. You were treated well. It was a suburban neighborhood. It was a pretty place. You had lots of stimulation, all of that stuff.

But I hated it. I was oppressed by lots of things. I believed, I sincerely believed, that the world was going to end in nuclear war before I was in college. It just seemed like it clearly was likely to happen.

I was interested in math and science, but all the math and science was defense related. Only big government projects to kill people were the only way you could get funding for things. More than half the world was in the grip of brutal totalitarian dictatorships, and no country had ever emerged from communism to freedom and prosperity. It seemed like the entire, world even the free world, even the relative democracies, were run by paranoids and total incompetents.

The economy was terrible. Seattle was a few years ahead of the rest of the country and we had sort of slipped into that '70s malaise back in the '60s. A friend of the family who was an aerospace engineer who was the world expert-- in fact, he went

to MIT. He was the world expert in materials for supersonic wing design. He was fired because nobody wanted to build supersonic planes, and he was driving a cab.

Another thing about this is this is, again, Seattle was kind of forward looking in terms of economics. We were getting economic malaise before the rest of the country. In another way, we were kind of a throwback. It was more like the '50s than other parts of the country. And it was this really weird social dynamic. OK, I don't want to tell you the neighborhood I grew up in was any worse or weirder than any other neighborhood. But there was a certain percentage of alcoholics, or child molesters, of wife beaters, of drug addicts, all the stuff.

And in the '50s and in Seattle by the time I was growing up, nobody cared about it. Nobody would ever talk about any of that stuff. If a man cut his grass and brought home a paycheck, he was a good guy. He could do anything else and nobody would talk about it. But if you didn't-- and we would have this. It would happen. Like a neighbor, the guy would lose this job. They would quietly move away, and nobody would ever talk about them. It was just weird.

And you got the message, OK, the economy was very insecure. If you could earn money, everything was fine. You didn't have to worry about anything else. But if you couldn't earn money, it was unspeakably bad.

Well, I was a shy kid. I was introverted, awkward. But I liked looking in the back of a newspaper at the numbers. The patterns in the numbers really fascinated me. And I worked out ways, and I would bet money on horses, I would bet money on other sports. And I found out I could win doing this.

I also found out-- and this was true throughout the American West at the time. I couldn't really find a good picture of this. This is just something I found on the internet that's roughly equivalent. Taverns, in the back room of the taverns or the basement of the taverns, there were these poker games. And I'd go in and I'd play, and I'd win.

And more important than that I would win, I could walk in. I could collect the money.

I could walk out, and this was enormously liberating to me. It said to me, OK. You don't have to get a job. You don't have to go to college. Anywhere you go in the world, you can find a poker game. You can win money. And when you're a good player and people know it, even if you run out of money, people lend you money. People stake you.

You also start getting into this network. And this was something I had not expected at all. I had gone there, I thought, OK. I'm going to win some money, and I'm going to prove that I can get this monkey off my back and I don't have to worry about this anymore. These people-- the people I was playing with didn't look like this. One or two of them might have looked like this. But there were policemen, there were sailors, there were clerks. You know, people.

And they end up owing you money. Right, if you're good player, these people end up owing you money. And I later kind of figured, I sort of had a half idea of what was going on at the time. But I've later figured it out a little better, and later in life as I've played more places, I've figured out the system a little better. I had a purpose for these people. I had two purposes.

One is because I was a good player I protected their game. Let's say somebody showed up, a really good player wanted to take all their money, show up and-- well, they had somebody there who was good. And by the way, being a good poker player in those days didn't just mean good card play. In fact, it would be trivially-- and I'm sure anybody here what have no trouble cleaning up in terms of pure card play in this game. But you had to be able to spot cheating. You had to be able to figure out who might risk of arrest. You had to figure out who might get violent. I mean, there's a lot of social skills involved in this.

So by being a good player, you protected the game, but you also connected them with a bigger network. So remember, a lot of this is about credit equation. A tremendous amount of economic activity goes on here. There's doctors, lawyers, police, mechanics, whatever-- people exchanging services, underground economy, people who couldn't make it in the normal economy. Like let's say you're a lawyer,

and you're a really bad lawyer. And you can't get any business. You hang [? out a shingle, ?] nobody's going to hire you. Your resume isn't very good. There's too many lawyers around.

But you know, you owe somebody money at a poker game and they want you to write a letter and do some for them, whenever, you can do a little legal business on this stuff. And by connecting into the broader network in the city, you connect these people in. Some of these people had really dropped out of normal life, or they weren't getting paychecks. They were subsisting entirely on the underground economy. And this was a very important organizational tool. Other people like to keep one foot in that world-- maybe a little side income, maybe a little fallback.

We weren't doing like big organized crime, but there'd be a sailor in the game who could bring in Cuban cigars. There was a guy who was maybe a bathroom attendant at a fancy restaurant who could sell them, and this kind of stuff could get organized in a game like this. The poker was very important because you actually spend a lot of time with these people. You learned a lot about them. You couldn't fake it in a way. An undercover cop could show up for two days or act something this, but they aren't going to be playing poker every day for years.

So I'm kind of moving up in the Seattle poker network, and I come to Boston. I went to Harvard. And again, remember, I'm shy. I'm awkward. I'm from the west, a little overwhelmed by all this stuff. But I walked in with a network. It shocked me when I got here that this network was seamlessly translated across the country, that I knew police, I knew poker people of all different ranks and stations of life.

I got into poker games at Harvard itself. People talk about going to college to get contacts. Let me tell you about that. I had three roommates. I love my roommates. These are great guys. I'm not saying anything bad about them. But in terms of like useful contacts for me in life, well, one of them's a corporate lawyer, one of them's a TV producer, one of them's a law professor-- all great things, that's nice. Never really a lot of use to me in terms of advancing my business interests or whatever, and not exactly hard things to break into, right? You want to know a corporate

lawyer? Well, it's pretty easy to know a corporate lawyer.

Poker games at Harvard, I played with George W. Bush, who went on to be president. I played with Bill Gates, Steve Ballmer, Scott Turow, people who are celebrities, politicians, rich people. Those are the poker connections. And a poker connection is very different. You're not playing poker with your friends. A poker connection is, there is a business relationship in there that can be extremely useful. My whole life, my whole career, has been informed by poker networks.

Now I'm going to zip through a few things. I'm playing in Boston, a guy shows up. He actually managed a card room near Stanford University. He was, again, it's this network thing. So I'm playing now in a pretty senior game in Boston, some the best card players in Boston are here, pretty high stakes. And they invite visiting pros from other parts of the country to keep the network connected throughout the country.

And this guy said to me, he said, well, I was good. I played well that night. But it wasn't just that. He said, you know, you're a kind of strange guy. You've got this sort of mathematical poker sense. You think about it in theoretical terms, whatever. There are a lot of guys like you out in Gardena, California. So that's where the best poker in the world is being played. He said, I'm a good player. I'm a national pro. I go around from city to city sitting in end games with the best players in the city. And I win in those games, but I can't turn a profit in Gardena. You should go the Gardena and see if you can match yourself up with the best.

So I go there. How many people have heard of Gardena, California? Yeah. If you're interested, there's a movie called *California Split* that's got some good scenes. It's stupid poker movie for the most part, but it has some actual scenes shot in Gardena at that time. That was the best poker in the world. And it was the network theory I was talking about on steroids because of a few things.

First of all, this is in the late '70s. Marginal tax rates have gotten really high, regulation has gotten crazy, the tax code is incredibly complicated and corrupt. Community property, big thing-- a lot of these guys were wiped out in a divorce. I mean, that was something that just didn't happen 10 years earlier. A lot of them had

tax liens. So you have this whole group of people, they tend be-- they were much better educated than the guys I was playing with in Seattle or even really the guys in Boston. They were smart.

Not only were they broke, they were financially toxic. Any money they put in a bank was getting whisked away by somebody. If they were walking down the street with \$1 in their pocket, somebody could grab it. Poker chip, not so much, right? Poker debt, they lent some money to somebody in the poker room, nobody could collect that. Tremendous amount of very active underground economy going on.

I go there, and first day I'm there, guy comes up to me. He manages a motel. He used to own it, went bankrupt. Now the bank pays him to manage it. If you're a poker player, he'll give you a room to stay in. You have to pay. You slip him a little bit of money, much less than the rent would be. It's kind of furnished with broken down stuff other tenants have left. But poker players don't care, right? Poker players are there, they go, they sleep on the broken couch, and then they leave. Maybe take a shower if it's the first of the month or something.

And you'd stay there for three or four months, and eventually the owners would kick you out. And he'd just say, oh, well, the guy never paid any rent, and he would cover all this for you and do it. And then you just move to the next motel down the line, and he moves somebody else in. You wanted to get your car fixed, you wanted to get a lawsuit filed, you wanted to get your operation done, whatever, there were people in the room to do it, all for under the table, you could borrow the money.

And all of the people who can invented the modern poker, if you talk about the David Sklansky's, Mason Malmuth, Mike Harrow. I don't know if these names mean anything to you, but these were the first people who actually sat down and wrote poker theory books. This was the only place where people were really thinking about it. Las Vegas, they hated poker. Casinos hate poker. The reason casinos hated poker is somebody in the building was losing money and the Casino wasn't getting it. And they would stick it-- they either wouldn't have poker, or they'd stick it next to the layout of slot machines under the stairs. They'd open and close the room

at random intervals.

The one thing they did was the World Series of Poker. It was a pure Casino publicity stunt. It had nothing to do with poker in those days. Only in like the late '90s, early 2000s with lots of people being brought in by internet, with the poker boom, with television did casinos really come to terms with it and start liking poker. But Gardena was pure poker, and that's where the good stuff was done.

Now, I'm making my living by poker. But I have broader interests. I'm thinking-- I was really, when I came to Boston for four years, I was shocked at how shoddy I felt that most quantitative analysis was. I thought, people are doing this work. They're teaching this stuff. They're advising the government. They're running the government. They're writing these papers, this and that.

They have terrible data. They have really stupid analysis. And the biggest thing, the way I kind of encapsulated all of this is, none of them would bet a nickel on their own results. Every single one of them, if they were buying a car, they would spend a lot more serious commonsense analysis to get the right car than they do recommending a plan for the government to take over the steel industry, or something like that. And a lot of other people felt the same way.

And we had both some philosophical and some empirical ideas that we were sold on the idea of quantitative analysis. We were confident in our ability to make bets and win. One of the things about hanging around with gamblers, there's a lot of bets. Gamblers are really nasty people, a lot of really bad stuff. One of the flip sides of that is you don't have to be nice, which takes a lot of pressure off.

But they do take things seriously, right? Anything you say, somebody can say, put some money on it. If you won't, you're just an idiot loser chattering. You'd start really thinking about things if you actually have to bet money on anything, any opinion you get. A lot of silly chattering conversation never happens if people have to bet on everything they say.

Anyway though, the natural thing to do is to say, OK, I want to go to a place. I want

to prove that my methods work. And the way I'm going to prove my methods work is I'm going to go to places where people gamble, and I'm going to prove that I can win. Now, all of us had read Ed Thorpe's *Beat the Dealer*. Do people here know Ed Thorpe? OK, you should. You should read his books. You should meet him. He's still alive.

He was a mathematics professor. He invented blackjack card counting. He managed to beat virtually every other Casino game. And he's also either invented or perfected almost all of the quantitative hedge fund strategies that people use today. He was one of the most successful hedge fund managers for many years. So one thing we did is we wanted to go and beat casino games.

And then what I'd like to talk about, I'm just going to mention this very briefly. But roulette, to me, was the one that really changed the way I think about a lot of stuff. It's a very, very important lesson for people who have academic statistics backgrounds. How do you beat roulette? OK, well this Ed Thorpe's. Ed Thorpe was thinking about this. And he was hearing this debate, and some people said, you should [INAUDIBLE] You should just record the patterns of the wheels and see if you can notice patterns, like the wheel's a little weighted, what number comes up a little more than the others.

But other people said no, that's impossible. The wheels are too good. And Ed had a really remarkable insight that not enough people know about. He said, you can win money either way. If the wheel's broken and 13 comes up a little more than it should, you can bet on 13. That's easy.

But if the wheel is so perfect that every number comes up equally often, it must be machined to perfection, then you can use a little physics. We had some mechanics up on the board when I came here. Use Newtonian physics, and you can figure out where the ball is going to end up. So it's a lot of work. He did it with Claude Shannon. Again, we're back to MIT, one of the fathers of information theory.

And they sat down, and they worked on roulette. And if you study this problem for a bit, you pretty quickly find out, here's how things work. The way roulette works, they

spin a wheel in one direction, and they spin a ball around the outside of a bowl the other way. OK, everything is very Newtonian until the ball goes away from the edge. It is very easy with a little bit of electronic aids-- which at the time were legal, and are now illegal. But with electronic aids, it's very easy to tell what number will be under the ball when the ball leaves the edge.

Now, there's a lot of bouncing and banging around between that and when the ball comes to rest. And that's pretty chaotic, essentially impossible to predict. So you have this perfectly predictable section, and then you have this chaotic section. But here's the insight. The predictable section, you can calculate. You can know, OK. You say, when the ball goes under the edge, number 17 will be directly underneath it.

The chaotic part cannot be uniform on the wheel. You can say, if 17 is under it when the ball comes down, here is the distribution of places the ball is going to end up on the wheel, and it's nowhere near random, nowhere near uniform. So you can make good bets. Now if you actually want to do this, you have to get several layers. You have to keep refining this notion. But I just want to focus on the big picture.

A lot of statistical theory, the basic theory of statistics, was based on dice. That's what Nassim Taleb calls the ludic fallacy-- people trying to create randomness. The real world is nowhere near so random. Even when people try to create randomness, even in a Casino, they can't do it. And the reason they can't do it is if you build things really, really precisely, they're predictable. If you build things kind of loose and sloppy, they have non-uniform patterns. What you can't do is build a device that's both. It exceeds human capabilities.

And when we're talking about the practical randomness you see in the world-- in the stock market, in politics, and in war, anything you want to talk about-- people are way too sloppy in modeling things as random. Whenever somebody says this thing is random, you say, I'm going to take a hard block. And I'm going to find little pockets of predictability that I can calculate. And in between those pockets of predictability, I'm going to find patterns that are non-uniform.

And what I'm going to end up with is I'm going to end up with a system where people are saying, you know, you're obsessing about data and data quality for things that don't really matter very much. Nobody else thinks these statistics are important. Why are you spending all your time cleaning data for something that's far removed from the essential economics of this problem? And they're also going to say, and here are the really important things. And you're just waving your hands. You're not paying attention.

You're making criminally reckless or crude assumptions about those things. But what they don't understand is that's exactly how you beat it. That is what you do. When you figure this stuff out, you really come up with this thing that will understand and make a profit, it will look like that to outsiders, that you're focused on stuff that doesn't matter and you're ignoring the stuff that does matter. Put another way, the stuff you think that matters doesn't, and the stuff you don't think that matters does. And when you do enough work on this kind of stuff, that's how you win.

Now, the thing about the people who did blackjack card counting and roulette and baccarat and craps worked on all those other games, what happens when people find out that's what they're doing?

AUDIENCE: [INAUDIBLE]

PROFESSOR: Yeah, it depends on the time and the place, whether you're buried in the desert or just warned off or whatever. But basically, you have to fool the casino. You're taking money from the Casino. The people who stuck with this hate casinos a lot more than they like money. They tend to be antisocial people. You don't need any social skills, right? All you need is-- I mean, if you've seen some of the movies, the MIT blackjack team, *Bring Down the House*, whatever, you see some wildly over the top play acting to get things. That isn't what most of these guys were.

Most of these guys were quiet. They went in, the casino gets a game. The casino takes care of stuff. You just go in and play, but you have to stay under the radar. You can't let the casino notice. Now, people also looked at another field, sports betting. Now, sports betting, this is frequent of stuff. This is Bayesian stuff. It is a lot

easier to predict how people are going to bet than how a game is going to come out.

If you wanted to predictive a game from first principles and figure out what the proper point spread was, well, you've got a big job ahead of you. It can be done. People have done it and made some successful results, but that's a big job. Here's an easy observation that was enough. In the 1970s, this was enough to make money. Los Angeles Lakers are a glamorous team. They were at the time. Los Angeles is a big betting city.

When the Lakers play at home, there's a lot of money coming in and betting on them. The point spread is going to be too favorable. Bet against the Lakers at home, right? Don't need a genius, don't need a math PhD, don't need a computer. You can just figure this out. And patterns like this are very easy to catch, but they're based on understanding people.

So the malcontents, the introverts, the autistic people, they all went here. The people who like people went into sports betting. Now what happens if you're sports betting and you're successful? What happens? Well certainly in those days, they hire you. Right? They want you. Great, hey, you're winning? We want to take advantage of that. We'll pay you a salary. You bet for us. And then the way they would pay you, by the way, is they would let you make bigger bets. And so you become part of the organization. And pretty soon, you're running your own bookmaking operation and so on.

So these are social people. These are Bayesian people. These people are betting on frequencies. These people are betting on people. Both of them are learning skills and techniques that nobody taught in a classroom, that were totally generations ahead of what statisticians were doing in academics, what people were doing in econometrics, anything like that. These people were because these people had to. It only worked if you're right. You're betting every day. Smartest people in the world are spending every waking moment trying to find a way to beat it.

I did some of both of these. I also did some poker. I was mostly a poker player.

Poker is kind of in between. OK, you've got some cardplay kind of thing, shuffle reading, things like that. But you've also got to know something about people. Not as much as a guy doing sports betting. You don't have to predict actions of thousands of people. But you do got to be able to look around the people at the table and figure some stuff out. You've got to be able to get invited to games. You've got to be able to collect from losers. You've got to be able to avoid arrest or getting cheated or beaten up and stuff like that. So we were kind of in between.

So a lot of people I know from those days-- this was the '70s, '80s, early '80s-- a lot of people stayed at it. But a lot of us, having honed our skills and figured, OK, now we think we know something. I've been playing poker since I'm 14. I've had moderate success in beating casino games and sports betting. I've had some really strong success at poker. I have some confidence, right? I don't just think I know something. I know something. And the reason I believe it is I've went to the places where you test that stuff and walked away with people's money.

So a lot of us went into finance. So this is really now we're talking about the early '80s. The people who like casino games, they like secretive little hedge funds. They wanted to invest their own money. There are only a few wealthy investors. As soon as they could, they wanted to pay off their investors and just be by themselves. And some of this really brilliant stuff [INAUDIBLE] fairly narrow focused. They had to like pick some narrow niche kind of thing and do it.

Bayesians, these people were naturals. These people went into big bank stuff. They knew people. They knew businesses. They were bank executive types. And by the way, in these days I'm talking about, you left math off your resume if you wanted to apply for a Wall Street job. I'm not kidding. People thought if you knew math, it'd be like you want to go to the NFL. You know, the NFL, they don't want you if you've got a PhD in math. It's like they don't want smart people. Wall Street did not want people who knew math.

Some of them understood that smart people would be dangerous. Others just thought that anybody in math had to be ivory tower and couldn't possibly know

anything. But still, once you got there, these skills were incredibly useful. If you'd been five, six years betting sports successfully, you know a lot of stuff about markets and businesses and how to run things with people that some of these other people would never learn their whole lives.

These people didn't have to get a job, but their problem was, could they find somebody to trade with? Could they get people to broker for them, to trade with them, and so on? So they had a lot of problems with that. Me, poker players, people like me, we could get jobs. We didn't want high level executive jobs though. We wanted to run some little department under the radar screen. We'd run a quant trading team. We do some pairs trading. We do some quant stuff. We do structured products. We did a lot of that kind of stuff.

We were used to networking-- we were good at that-- but under the screen. We weren't good at like showing up in a suit and tie and being nice to bosses and things like that. We weren't good at raising money, which is why we had to go hook up with a big firm. We liked the fact that a firm would give us trading capital, the firm would give us setup relationships, so we didn't have any problem opening up trading lines and things like that.

But we basically got to keep what we made, or we got to keep a portion of what we made, which is a way we like to do it. This is what really revolutionized Wall Street. The thing I tell people is, having lived through this from the early '80s to now, it's people don't understand how much finance has changed. An awful lot of finance is written as if there's some continuous history, some minor technical innovations, electronic trading is just a little bit faster way of people yelling at each other in a pit.

Well, it's not true. The entire fundamental technological basis of finance has changed, has completely been redone. I use the analogy of a digital camera versus a chemical camera. They kind of look the same-- or they used, now they're in your phone. But a few years ago, a digital camera looked kind of the same. It runs on battery. It's got a flash. It's got a lens. It's got a shutter button. People use it for the same thing. They take pictures of their friends, their vacations, their parties, things

like that.

But the technology inside is entirely, totally different. If you want to make a camera, you hire completely different people, use completely different processes, the theory is completely different. Well, that's the difference in finance. And the people of my generation, the quants in my generation, are the ones that built that. And most of it has a lot more of its genetics come from sports betting and betting casino games and poker than it does from economic theory of the 1970s and 1980s era vintage.

For those of you who are interested in this stuff, I put a few books here. I did these in alphabetical order of title. I do have couple of my own books here, but *Beat the Market* by Ed Thorpe. Just read anything you can by Ed Thorpe. A lot of it's available free online. You've just got to. That's a guy who understands stuff.

James McManus, a friend of mine, wrote *Cowboys Full*. Some of you may remember James. He made the final table at the main event of the World Series of Poker and wrote a best selling book about it, which is a lot of fun, too-- *Positively 5th Street*. But this is a history of poker if that's what you're interested in. It's really the only good history of poker.

This is a really interesting book, *The Economic Function of Futures Markets*. For about 100 years, people wrote nothing but nonsense about futures markets. And then this guy came along. He had a PhD, came along, and wrote a thin book about 1990 that absolutely explained it. And it's funny, because after reading nonsense-- just transparent nonsense about futures markets all the time-- this guy wrote a book.

And the thing about this book is it's logical. It makes sense. He's got a story. It makes sense. He's got empirical evidence for it. He nailed it. He explained what futures markets are. And nobody ever paid any attention. I mean, nobody ever cites it. Nobody ever reads it. Whatever. But if you want to know futures markets, this is the guy who explains it.

Fischer Black-- by the way, this is the hardback which has a blue cover. If you buy

the paperback with a black cover, it has a foreword by me. So I go for the paperback. But this is really interesting. If you're interested in the time when I was at Harvard and hanging around MIT and talking to people who were arguing about this kind of stuff, Fischer Black was a very important part of that. I knew him pretty well in those days.

And there's a lot of really interesting stuff about how logic and rationality and mathematics actually came into finance. It didn't come in naturally. It was some eccentric thinkers-- Fischer Black was nothing if not eccentric-- who did it. And this book explains it. A guy by the name of Perry Mehrling, Perry Mehrling's a nice guy who wrote another good book, *The New Lombard Street*, that's very interesting about modern finance.

This is a book by Daniel Usner, who I do not know. This kind of covers the prehistory. This tells you what the world was like in the Northwest United States before poker came in. It goes up to, I think, 1791 or so. So it's a pre-history. But it's really fascinating economics. There was a really fascinating economy in this part of the world. The pre-modern economy, but it had within it more of the design of the modern economy than if you'd gone to London or New York at the same time.

This is a book, another guy I don't know. I actually talked to him a few times about this book when he was writing it, but this is *More Money Than God*. It's an excellent story of the early hedge funds, a lot of these people who were coming from these sorts of backgrounds, bringing some mathematics into finance. It doesn't have a tremendous insight. He doesn't get into the strategies or the intellectual ideas behind the things, but he'll tell you the stories of the people and what happened and stuff like that.

Two books that I-- I sort of did this as I was coming up with this and I just pulled up some books. But there are two that I left off that I was thinking on the train ride up I should have put on here. One of them is called *Poker Faces* by a guy named David Hayano. He's another guy, knew him in Gardena. He was a player in Gardena. He was also working on his PhD in sociology. Actually, he called himself an

autoethnographer. So he was an ethnographer who studied himself. And he wrote.

Anyway, he wrote he wrote a book on Gardena and the poker economy and what it was like. I'm actually in the book. But it really is a great book, and it really tells you kind of what the poker economy was like in the '70s. I think that was the last gasp that takes us back. It was a lot weaker than it was in the 1840s Chicago. So it wasn't as important to the economy, but it was still there. You could really see a lot of the relations, how things worked, really were there. I think that's kind of gone now. You really don't find that today.

Another one is by a guy, a friend of mine, professor Phil Tetlock lock at Wharton. He wrote a book called *Expert Political Judgment*. And that tells you a lot about what the things that drove me away from basically how bad experts are predicting stuff. And what really drives you to-- if you're good at this tough stuff, if you're a quantitative person, if you like to make bets, if you like to back your judgment, you've just got to stay away from experts. You've got to go someplace where you find out in cold, hard cash whether you're making good or bad predictions.

Pokerface of Wall Street, this is by me. This covers a lot of stuff I'm talking about, the connection between poker and finance. And *Red Blooded Risk*, also by me, this tells a lot more about how people brought ideas from sports betting and poker and Casino games and how that entered into mainstream finance. OK, that's what I've got. Any questions, comments? Yeah?

AUDIENCE: How good was George Bush and Bill Gates at Poker?

PROFESSOR: I can't really answer that in the sense that-- to really answer that, you'd have to like tracked their winnings and losing for long periods of time. Bill ran a game in Courier House. I didn't like the game. It was a very tense game. I always got the feeling people lost more than they wanted to and it wasn't a lot of fun to play. He was certainly a respectable player at the time.

You also have to understand, I'm coming from a slightly different perspective. I'm really at this point one of the best players in the country. We didn't really have

ranking back then, it was kind of hard to tell. But I would say there were maybe 100 people in the country that I would have felt more or less equal to, and I wasn't afraid of anybody. I would sit down at the table with anybody and play them kind of even. So none of these people where that level. None of these people were kind of serious, professional players.

But in somebody can be a very competent, careful player. George Bush was a lot of fun to play with. Ran a great game. I don't think he was too interested in the money. I'm not sure. He didn't seem to be. Probably more interested in the connections, by the way. By the way, that drove a lot of people. A lot of people-- I'm talking about this networking in kind of this abstract. See, I'm an introvert. So for me, it's kind of this amazing thing that you can create these networks. I'm thinking of them very mathematical and have a diagram.

A lot of people are just wired that way. They understand on some-- they don't sit down and draw network diagrams. They say, I'm going to play in this game. I'm going to make some friends. I'm going to chat with my friends. I'm going to buy a baseball team. I'm going to be president, whatever. It works for them.

And that stuff never works for me. I have to think about it. I have to do this on an intellectual level. [INAUDIBLE] I would say of the people I played at Harvard at that time, the two that were probably the best in my recollection were Scott Turow, the author, who was really could have been a pro level player. Probably didn't play enough to do it, but had the instincts, had the people skills and so on. And a guy named Lloyd Trefethen who's a mathematician at Oxford now and just was a really good-- actually taught me a lot of theory. We talked about that stuff a lot.

But all this, one thing I will say in terms of that. The people at Garden, the people at Gardena really were a cut above that. A pretty good club player at Gardena, somebody who just kind of was playing at the top stakes and breaking even, somebody like that was so much better than the leather ass Texas road gamblers who were playing off in the World Series of Poker and things like that. You went to Las Vegas, and these people just were not very good at poker.

Now, they were very good at making money at poker, which is a little bit different. But if you just sat down, if you just listened to the analysis they gave for why they did things when they did, it was just-- they believed in luck. They would make these arguments that just made no strategic sense at all. They weren't even thinking in terms of what you think of [? as ?] [? poker. ?] Now, that had very little to do with making a living at poker.

One of the stories I like to tell is there's a story that's-- I read it in a book, actually. I didn't know this at the time, but three WSOP winners-- It might have been Dolly Brunsen, Sailor Roberts. Sailor Roberts was a good player. He was probably the only one in that crowd that was really top. And one other, they used to drive around Texas and play in just local [INAUDIBLE]. OK, 3 WSOP winners playing in these Texas games and stuff, just local people. They should clean up, or they should make tons of money.

Sailor told me they broke even. They just weren't really making money playing poker. What they were doing was they were bag men for betting on high school football. So they were going to these towns, they were playing some poker. And then they were collecting the bets and moving around and getting paid for that. But the poker was a break even operation for them. So a lot of people who have great reputations in the poker place, lots of colorful stories, and just you set them down at a computer, you set them down at a tournament or something, they would just be toast in five minutes.

But the people, the people in Gardena-- who were much better in terms of theoretical poker playing and playing the game-- we would've been toast in that tavern in Texas, right? We would've been beaten over the head with a pool cue and left out with the cows or something. I don't just mean we weren't tough. We weren't tough. We aren't tough. We didn't have social skills. We had just enough social skills, some of us-- most of them didn't even have that. I was considered pretty social because I could actually get a game together of normal people and collect money and so on. Most of these people couldn't. They couldn't play with normal people. And none of us had the kind of skills that those people did.

Other questions? Yeah?

AUDIENCE: You think if you're a good player, are you better off making a big name for yourself or staying under the radar?

PROFESSOR: That's hard for me to answer, because I come from a strong tradition of being under the radar. It was very hard for me to come up. When I wrote this book, this was my first public acknowledgement. I mean, people who knew me knew I played. Including on Wall Street-- you know, I mean, a lot of famous people on Wall Street play and play with whatever. But to sort of come out in print-- and when I talk to people, I said, I'm going to tell a story about you in the book. And people who you would think would have no problem being identified as a poker player just would not let me do it.

But that said, there's a whole career out there. I don't know if it's still true, but there are people who made fortunes by being famous poker players. And the thing I always kind of wanted to do, I never liked tournaments. I don't like casinos. I played them sometimes, but I like playing when I want to play. I don't like being told when to play, and some of these casinos, the experience is just so physically unpleasant, playing at 2:00 in the morning and getting bad chairs or whatever.

But I was tempted by high stakes poker. And I always thought that would be kind of fun to go in there and play for cash and be on television and do that. That was one that I kind of thought of. But you also have to think a little bit-- like I say, people in AQR have no problem with me writing the books and giving talks like this and so on. I don't know about me being actually in poker after that. That probably would be a step too much.

So I think it's a choice you make, who you are. And I think if you decide who you are and you're true to it, you can be successful. What you don't want to do is put on a front. If you put on a front for something like that, it can come back to haunt you. So if you are a celebrity-- I'm just not a celebrity. I never could be. I'd never be happy being one. Nobody's offered to make me one, but-- and it wouldn't be right for me.

But if you are cut from that cloth, you should do it. Be true to yourself. Yeah?

AUDIENCE: How do you feel the view of mathematicians on Wall Street has changed since [INAUDIBLE]

PROFESSOR: Sorry, perception of what?

AUDIENCE: Of mathematicians.

PROFESSOR: It's gone through-- it kind of goes through. OK, so first, it was just laughable. And let me explain how Wall Street works, by the way. Wall Street is sales. Finance is sales. All the money in finance always has, always will be in sales. A few quants can make a couple of bucks on the edges-- a few billion, even-- but it's just not a lot in the whole scheme of things. If you can bring money in, if you can gather assets, it's always been rewarded.

So when the early quants came, the attitude is, let's say you're like LOR associate. People [? know ?] [? that. ?] O'Brian, Rubinstein, and I'm blanking. These are the people who did portfolio insurance in the '80s, whatever. Anyway, so these finance professors show up, these quants show up. What Wall Street is saying, hey great. We don't care. You could astrologers. You could be chartists, whatever. If you're gathering assets and you're giving it to us and paying us commissions to trade it back and forth, if you're giving people reason to trade, we're happy to service you. And we'll pretend we like you, and we'll pretend to respect you. Whatever, we don't care. And they really don't.

And so that was kind of the attitude toward mathematicians. If you have a way to generate trades and to talk people into trading, great, because we're just taking a commission. All we care about is that people are coming in and doing this.

Then they started figuring out that, you know, hey, wait a minute. These guys aren't like everybody else. These guys actually are making money. Some of this stuff really does make money. That's very, very difficult for Wall Street to come to terms with. There's a New York Times Magazine article about Lehman Brothers with Lou Gluckman and Peter Peterson, the clash of those cultures-- the shirt sleeve, cigar

chomping trader culture, totally at odds with the white shoe investment banking culture when these two things crashed.

So then people were kind of afraid of mathematicians, but also somewhat dismissive of them. So then I think it's kind of mellowed out a little bit. But I will still say, AQR is a quant hedge fund. When we go and do our credit thing, the credit counterparties, the assumption is nobody can understand your black box trading. Now, that's just not true. I mean, we are very transparent. We can sit it down. And certainly any of you could figure it out in five minutes, but other people would maybe take an hour.

But we can lay it down. Here's what we do. Here are the eight signals and we measure these things. And we add them up and we find the best and we buy this and we short that. It's a lot simpler than somebody who's saying, oh, I'm doing this quantitative analysis or technical analysis or fundamental stuff and I'm thinking about all these 80 factors. We tell you exactly what we do.

And they always assign the most junior credit person to us, because they figure nobody can understand it anyway, so why waste somebody who knows what's going on? That kind of prejudice you still find a lot, that somehow what we do is crazy. It's a little weird. Nobody can really understand it. It seems to kind of work, so we'll continue to do business. We'll recommend you. We'll put our client's money in you, but not with the same confidence we have with a guy who's saying, I went to the company and I pounded the tires and I talked to the CEO and I shook him and said, tell me what's really going on here. And I understand this stuff.

The biggest problem is you're quant's not confident. It's still the case that people measure your credibility, how much they believe you, by how confident you are. So if I come in and say, well, I got this model. It seems to work pretty well. I think I got a 60% chance that this trade will make money. They just think you're-- they don't know where you're coming from, what planet. A guy comes in and says, I'm sure this is going to work. It's got to. I've got all these 87 reasons, whatever.

Now, they don't believe them. They think it's 51% just like. But they expect him to be

confident and they understand that. So I think that's the biggest problem. If you want to be a quant and you really want to be honest about your confidence for things, it is shocking to people how little you know. It is shocking to people that with all this work, 51% is still pretty good. And that, I think, is a barrier we're going to have real trouble ever surmounting. A quant can understand, hey, 51%? Enough bets, you can be a casino raking in the money in roulette. That's great. Non-quants have problem with that concept, which is why they're playing roulette without the glasses.

OK, we--

AUDIENCE: We don't have enough time.

PROFESSOR: Well, thank you very much for your attention.

[APPLAUSE]