

AMAZON ORIGINAL STORIES

R6N014E  
R4ND0MIZ3  
RAN0M1ZE

9RAN0MIZE  
RAN0MIZE  
9RAN0MIZE

ANDY  
WEIR

FOR»ARD

AMAZON ORIGINAL STORIES

# RANDOMIZE

ANDY  
WEIR

FOR»ARD

This is a work of fiction. Names, characters, organizations, places, events, and incidents are either products of the author's imagination or are used fictitiously. Any resemblance to actual persons, living or dead, or actual events is purely coincidental.

Text copyright © 2019 by Andy Weir

All rights reserved.

No part of this book may be reproduced, or stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without express written permission of the publisher.

Published by Amazon Original Stories, Seattle

[www.apub.com](http://www.apub.com)

Amazon, the Amazon logo, and Amazon Original Stories are trademarks of [Amazon.com](http://Amazon.com), Inc., or its affiliates.

eISBN: 9781542044257

Cover design by Will Staehle

**E**dwin Rutledge looked out his windows to the sprawling Las Vegas Strip beyond. His office atop the Babylon Hotel and Casino was the definition of opulence. Italian leather couches surrounded a tasteful glass coffee table. Guests had no idea they were sitting in seats worth more than a typical car. But in a city of extreme displays, silent quality appealed to Rutledge more than a neon sign saying **I'M IMPORTANT**.

Still, some demonstration of status was needed. Mahogany bookshelves and curio cabinets stood on fine Persian rugs. His antique walnut desk backed up against a stunning view of the cityscape.

“Sir,” came his secretary’s voice through the intercom. “The IT person is here.”

He adjusted his diamond cuff links and pressed the intercom button. “Send them in.”

The double doors opened, and an uncomfortable-looking man shuffled in. He looked more like a customer of the casino than an employee. Ill-fitting jeans, a T-shirt with a *Star Wars* reference on it (or maybe *Star Trek*—Rutledge could never tell the difference), tennis shoes, and absolutely no effort put into controlling his wild hair.

Rutledge gestured to the leather chair facing his desk. “Have a seat.”

The man nodded awkwardly and sat down. He looked for all the world like a child who had been called to the principal’s office.

“So, Mr. Chen—”

“Nick,” he interrupted.

“Sorry?”

“Call me Nick.”

“Ah,” said Rutledge. “Mr. Chen, please tell me why my keno lounge is off-line.”

“Okay, so what happened is—”

“The keno lounge makes the Babylon two hundred thousand dollars a day,” Rutledge interrupted.

“Yeah, but—”

“And you turned it off. So you, *personally*, have cost us two hundred thousand dollars today.”

Chen scowled. “No, I saved you millions.”

Rutledge raised an eyebrow.

“Have you heard of quantum computing?”

“I see it on the news from time to time.”

“The past few years have had *major* advances. Noise reduction is solved, coherence protection is damn near perfect, and long-term state management can keep a qbit safe for months. But today is special. Today, QuanaTech’s new Model 707 hits the market. It’s a total game changer. It’s a 1,024-qbit system, with a 512-qbit long-term memory capability. And we’re talking *logical* qbits, not just physical—”

“I’m going to stop you right there,” said Rutledge. “None of that has any meaning to me, and it has no bearing on keno.”

Chen balled his fists. “Yes, it does. And I’ve been trying to warn people about it for months. But your stupid upper managers just keep ignoring me. So I used my override passwords to shut everything down.”

“Turn it all back on.”

“Look, I’m trying to *protect* you. If you want the keno system back on, no problem. I’ll log in from your computer right here and bring you to the main control page. I’ll even tell you what button to click. But *you’ll* be the one to click it. Not me. I won’t be responsible.”

Rutledge held up a hand. “All right, Mr. Chen. Obviously this is something you’re passionate about. Calm yourself and explain.”

Chen took a frustrated breath and let it out again. “Okay, yeah.”

“Quantum computing is a totally different animal than normal computing,” he began. “It takes advantage of weird quantum physics properties like superposition and entanglement to solve math problems. It’s usually way slower than normal computers at math, but for some problems, it’s exponentially faster.”

Rutledge nodded. Best to let the man say his piece, even if it seemed irrelevant.

“What do you know about random-number generators?” Chen asked.

“Nothing.”

“Seriously?”

“My job is to own and run this casino. I’m not arrogant enough to think I can understand every detail of its operation. I hire experts like you to handle specific areas. I expect you to know it.”

“Okay, fair enough. Here’s the thing: There’s no such thing as an actual random-number generator. Computers create *pseudorandom* numbers.”

“What’s the difference?”

“Pseudorandom numbers are made with a complicated math formula. You plug one number in—called the seed, or the starting point, for the mathematical formula—and you get a sequence of seemingly random numbers out. The formula has exponentiation and remainders and all sorts of other stuff to make it non-reverse-engineerable.”

Rutledge wiped a small blemish off his class ring. “Okay, that makes sense. If you give the generator the same seed, will it give the same sequence of numbers again?”

Chen pointed at him. “Yes, exactly! And that’s the problem.”

“This system has been in place for decades with no issues.”

“The problem is quantum computers. Remember how I said the formula can’t be reversed by knowing the outputs?”

Well, that's not quite true. It's not reversible with traditional CPUs—it would take all of Earth's computers centuries to check every seed value. But quantum computers use a different approach. They sort of"—he waved his hands around—"try all possible values at once, then collapse to the solution. It's complicated. Long story short: they're *very* good at finding solutions to problems like this."

"Hmm, I see," said Rutledge. "If someone were to do this, would they be able to predict the numbers the keno machine creates?"

"Yes," Chen said. "With the QuanaTech 707 available to consumers now, I had to shut down the keno lounge. Scammers are probably working on random-seed crackers as we speak. It's only a matter of time."

Rutledge stood and walked over to the wet bar behind his desk. "This is an interesting problem. One entirely new to the gambling industry. Can I mix you a drink?"

"Uh, no thanks."

"Mm." He never trusted nondrinkers. They either didn't know how to enjoy life or they were self-righteous. Either way meant they were difficult to work with. He added ice, rum, lime juice, and simple syrup to a shaker. "Do you have a solution?"

"Yes, sir. But it's expensive."

He poured the drink into a cocktail glass and took a sip. Nothing like a good daiquiri. A *real* daiquiri—mixed over ice and served neat, not blended into slush like a 7-Eleven Slurpee. "What's your plan?"

A twinkle in Chen's eyes. "We fight quantum with quantum. I need one of those QuanaTechs. I can write software on it to generate random numbers. *Genuinely* random numbers. Quantum physics is the random-number generator of the universe. They would be completely impervious to pattern reversal because there is no pattern."

"How much does one of these computers cost?"

Chen drew back a bit. “Three hundred thousand dollars, plus a few expenses to get it set up and running. I know it’s a lot, but—”

“Is that all?” Rutledge said. “Sure. Let’s do it.”

“Wow!” Chen said. “I mean . . . I didn’t expect you to say yes so fast.”

Rutledge shrugged. “I’d be an idiot to ignore my own IT department.”

“Oh man, this is going to be so cool.” Chen grinned. “I mean—I don’t want to sound unprofessional, but wow! I get to play with my own quantum computer. That’s, like, a dream come true!”

“I’m glad you’re happy. How long until the keno lounge is back online?”

Chen looked up in thought. “I spoke to the people at QuanaTech; they send a person out to help set it up. If we ordered today, and asked for it to be expedited, the computer could be here and basically set up in two days. A random-number generator in quantum logic is incredibly simple to make—I could finish that in an hour. Hardwiring it to the keno system . . . I think three days total ought to do it.”

“Get it done. I’ll give you four hundred thousand for the computer and incidentals. It’ll be in your departmental account by the time you get back to your desk.”

Chen left the office with a smile.

**“We fight quantum with quantum.”**



Never before had Chen felt such a connection.

The QuanaTech 707’s sleek cylindrical case glistened in the blue mood lighting. In front, a simple monitor and a black keyboard awaited his touch.

Prashant Singh, the representative from QuanaTech, finished inspecting the cabling.



“Okay, we should be ready to power it on,” said Prashant. He looked up at the ceiling. “Kind of a strange room. Were these blue lights always here?”

Chen didn’t take his eyes off the computer. “I installed them yesterday. Cool stuff needs cool lighting.”

“Your staff doesn’t seem very happy,” Prashant said. “I got a lot of dirty looks from them.”

Chen waved off the comment. “I had to move the server racks into the break room to make room for this baby. They’ll get over it.”

“Okay . . .” Prashant pressed the “Power” button. Within three seconds, the screen showed a blinking cursor. No bells. No whistles. Just a keyboard and a console. Exactly the way computers should be.

“Sweet! I want to make a random number.”

Prashant opened the user’s manual, flipped a few pages, and handed it to Chen. “There are several preinstalled programs for testing stuff out. They’re all listed here.”

Chen took the book and squinted at the page. The blue light was amazing but not great to read by. No matter. It wasn’t about utility. It was all about coolness.

He set the manual aside, cracked his knuckles, and walked over to the keyboard. “Okay, here goes!”

```
>EXECUTE RNG_TEST
```

```
>RANDOM BIT RESULT: 1
```

```
>END
```

```
>|
```

“Oh my God! Chills!” Chen beamed. “Are we all set up now? Good to go?”

“Almost,” said Prashant. “I still need to install the long-term memory unit.”

“Ah, right. That shit’s amazing. Keeping state for months at a time? You guys are geniuses.”

“Well, not me,” said Prashant. “The geniuses are all back at the office. I’m just the site sales rep. Truth is, I barely understand the physics going on in there. But I do know no other company can offer five nines of coherence protection on memory qbits.”

He opened a plastic case on the floor. Inside was a well-insulated metal box with a few cables attached.

“Did you hear about the Cove Casino?” Chen said. “Just down the street?”

“No, what happened?”

“They lost two million dollars at their keno lounge this morning before they pulled the plug on it. The scammers used small bets, and hundreds of them. There was no way to sort out the cheaters from legitimate players, so the Cove had to pay out on all the tickets. It’s all over the news.”

Prashant frowned. “We don’t condone our products being used for illegal activity.”

“Yeah, I know,” said Chen. “Point is, I was right. The boss totally loves me now for predicting that would happen.”

“I’m glad to hear that,” said Prashant.

“I bet I get a hell of a Christmas bonus this year.”

“Good, good.”

“If some scammer tries to reverse engineer *my* system, they’ll get a nasty surprise. True random, motherfuckers!”

“Okay, but remember it’s only as good as the security on this computer itself,” said Prashant. “If this system gets hacked, someone could replace the software with a pseudorandom algorithm on a seed they pick. They’d know all the numbers in advance.”

“Oh, I’ve got that covered,” said Chen. “This baby is air-walled. It’s not connected to the casino network, has no access to the internet, and can’t take incoming communications in any way. It’ll have a hardwired connection to the keno machine. And I won’t even implement a request-response system. It’ll just feed a set of keno numbers across every

fifteen minutes. That way there's literally no information entering the 707 in any way. You can't hack what you can't talk to."

"Most company fraud cases are inside jobs." Prashant glanced out the door to see if the other IT employees had heard him say it.

"Not a problem. This server room is a vault, and only I have the key." Chen patted his pocket. "And the security system texts me whenever the door opens. So even if someone did get my key or make a copy, I'd know as soon as they got into the room. I'd have armed guards here in under a minute."

Prashant wrangled the cables of the memory unit. "That does sound solid, but remember a system is only as secure as the humans who operate it."

"I've been in IT for seventeen years," said Chen. "Believe me—I know that."

Prashant plugged the last cable in. He typed a few diagnostic commands into the system, then nodded approvingly at the output. "Okay, the memory's online, and the system all looks good."

Chen stroked the monitor. "Okay, time to do some quantum coding! Daddy's keno baby needs its numbers!"

"Have fun," said Prashant. "I'm in town until tomorrow morning. Call me if you have any problems. In the meantime, can you recommend a good restaurant in the area?"

"Are you kidding?" Chen said. "You think you're buying your own dinner tonight? Oh, hell no. Go up to the high-rollers club. Your name's on the list. Get yourself anything you want, on us."

"Wow. Thanks," said Prashant. "Give me a call if you run into any problems."

"Will do!" said Chen.

Prashant left the server room with a smile.



### *Yesterday . . .*

Sumi packed her husband's suitcase. His trip to Las Vegas would be a whirlwind. An afternoon flight there, setting up a computer for the Babylon Casino the same day, and then a morning flight back the next day. Many wives would worry about their husbands going to Sin City by themselves, but Prashant had always been a loyal and devoted man.

Technically he would need only one change of clothes, but his carry-on had more space, so why not include some backups? She packed three immaculately ironed and folded white shirts, along with two pairs of black slacks. She added two blue ties and threw in a red one just for fun. He looked so handsome with a red tie on, but he always wore blue. Ah well. She put a ziplock bag full of homemade pedas on top—a little snack for his hotel stay—then zipped up the case.

She walked to the kitchenette, where Prashant dined on the rice and dal she'd made for him earlier. "Do you have enough yogurt?" she asked.

"Yes, thank you," he said. "This is delicious!"

"There's kheer for dessert, so save some room."

"Mmm," he said.

She sat at the table across from him. They almost never ate at the same time—she'd grown up in India, where dinnertime was 8:00 or 9:00 p.m., and he'd grown up in the US. Still, the arranged marriage was very successful. She couldn't imagine herself with any other man.

"Are you nervous?" she asked.

He set his fork down. "To be honest: yes. This all seems very dangerous. Las Vegas is . . . well . . . the people there can be very threatening."

"It's up to you. We can just do nothing if you want."

"No, I want to do it." He gestured around to the apartment in general. "This isn't what I want for us. For you. A ridiculously expensive one-bedroom hovel in a questionable

part of Oakland? People who work in Silicon Valley can't afford to live in it. It's absurd."

"I have no complaints," she said.

"You deserve more. And we are trying to have a baby. We need more room. And for that, we need more money. But still, if we get caught, we could spend a long time in jail—"

"That won't happen," she said.

"We haven't really had a chance to go over how this whole thing works. Can you be certain we won't be caught?"

"No. But in the absence of evidence, why would anyone suspect us?" She stood from the table and walked to her work area in the tiny living room. Her QuanaTech 707 hummed gently. A cursor blinked on the monitor, awaiting instructions. Two long-term storage units sat connected to the computer.

He craned his neck to watch her. "How hard is this to set up?"

"It's trivial." She executed a program on the console. In less than a second, it was done. "That's it. Every qbit on my storage unit is now entangled with a qbit on the unit you're taking to the Babylon."

"You're *sure* there's no way they'll know the qbits are entangled?"

"It's physically impossible to know if a qbit is entangled."

"And how exactly does entanglement let us cheat at keno? This quantum stuff has always confused me."

Sumi's parents had done their best. Her absurdly high intelligence had been clear as soon as she learned how to speak. They'd put her in the best schools for gifted children, but she still found them dull. They went deeply into debt to hire tutors just to keep up with how fast she learned.

Soon she would be able to repay them. And build the life she and Prashant wanted. The American dream.

Her parents knew they'd never find her a man as smart as she was. So they focused on "smart enough not to be left

behind.” Prashant was brilliant in his own ways. It was a wonderful match.

“Quantum physics is a confusing, nonintuitive thing,” she said. “The rules that govern the universe at the small scale are nothing like what we expect. Suffice it to say that two qbits can be set up such that if you randomize one, the other will become the same value. Once you set them up like this, they are ‘entangled,’ and it doesn’t matter how long you wait before using them or how far apart and unconnected they are at the time. Once they’re entangled, they are guaranteed to be the same when randomized.”

He pointed to the storage units. “So we have two copies of some data?”

“No, don’t think of it as data. Think of these storage units as two piles of dice, but the dice are magically linked, so if you roll a die and roll its counterpart in the other pile, they are guaranteed to have the same result.”

“That doesn’t make any sense.”

“Quantum physics doesn’t make any sense,” she said. “Please don’t try to think about it too much. It can be very distressing.”

**“Once they’re entangled, they are  
guaranteed to be the same when  
randomized.”**



He fidgeted in his chair. “Their storage unit and our storage unit are linked. So they’ll basically be talking to each other across the country. But didn’t you tell me once that quantum entanglement can’t be used for communication?”

She typed on the keyboard and ran a quick self-test. “I did, yes. And it’s true. But we’re using a loophole,” she said. “Two parties can’t communicate via quantum measurements.

But they can both observe their respective results and act accordingly.”

“That seems like communication.”

“Not quite. Think of an intersection with stoplights. The stoplights are, functionally, entangled. If I see that one light is green, I know the other light is red.”

“With you so far,” he said.

“Let’s say two cars approach at cross-directions. One driver sees a red light, and the other sees green. The drivers don’t talk to each other or communicate in any way. But they each observe their own lights, which lets them know what to do and what the other driver will do. There was no communication, just an agreement in advance on what red and green lights mean.”

“Okay, so do we have an ‘agreement in advance’ with the casino on what these qbits mean?”

“We do.” She returned to the kitchenette and stirred the kheer. “The Babylon Casino has a keno computer from 2002. Old but reliable—just what casinos like. The manufacturer has excellent documentation online, so I know exactly how the random qbit values will be made into random numbers. Running that operation on our own qbits will give us those same random numbers. That algorithm is the ‘agreement in advance.’”

“Why not entangle all the qbits and not just the long-term storage ones?”

She tasted the kheer. Just right. “Entanglement isn’t permanent. Those magic dice I was talking about? They only work once. After that roll, the spell is broken, and they have nothing to do with each other. If you roll them again, there will be no magic. Just two random numbers. So you get one roll—just one—where you know how the other die will be affected.”

“I see,” Prashant said. “So I assume the normal function of the 707 reuses qbits over and over?”

She served a generous portion of kheer into a bowl. Prashant loved sweet food and always wanted more than he

claimed. “Yes. The casino’s keno machine would exhaust our supply of entangled qbits in seconds. So the trick is making them use the long-term memory as RAM and striking right at that moment.”

Prashant pushed his plate aside to make room for the bowl. “How do we do that?”

“The 707 does a coherence self-check once a week. When you install the system, make sure those settings are set to do the self-check this Sunday night at 11:58 p.m.”

She adjusted her sari. American clothes certainly looked nice on Americans, but she preferred traditional clothing. “The self-check takes about five minutes. During that time, if the system is asked to do qbit operations, it uses the qbits in the long-term storage unit because the normal RAM is busy. The Babylon does keno draws every fifteen minutes—there’ll be a draw at precisely midnight on Sunday. That’s when we strike. We only have one attempt, though. The long-term memory has 512 qbits, and a keno draw is twenty eight-bit numbers.”

Prashant raised a finger. “Twenty numbers would only be 160 qbits. So we have, like, three tries before it eats all 512.”

She shook her head. “The numbers each have to be unique, and they’re all in the range of one through eighty. There will be a lot of duplicates drawn. The computer will have to generate random numbers until twenty *unique* numbers are drawn.”

“Ah.”

“Once the system hits the end of the long-term memory, it’ll loop around, re-randomizing, and reusing the already-measured qbits. We’ll have no information on any of that.” She sighed. “This all would be much simpler if I could modify the computer itself before you install it.”

“We’d never get away with it,” said Prashant. “There’s a factory seal over every entry point, and the OS is on a ROM. Same with the long-term memory module. It was easy enough to sneak it here for you to prepare it, but if we try to open it or



modify the hardware, the casino will know when they look over the system.”

She set the kheer in front of him, along with a fresh spoon. “Are you sure they would even notice?”

He nodded. “Pretty sure. I spoke to the Babylon’s IT manager on the phone. He’s . . . very diligent. He’s extremely thorough.”

“Then this is the only way,” she said. “Fortunately, the long-term memory comes pre-superpositioned. The system will skip the Hadamard operation on first use.”

“I didn’t understand that at all.”

“All that matters is that the system has a minor performance optimization that creates the security hole we’re going to take advantage of.” She returned to the living room and sat at the computer. “Now is as good a time as any to get the numbers . . .”

“Wait, what?” he said. “Now? I don’t understand.”

She typed a few commands on the console. “Entanglement is a two-way street. I can measure one storage unit’s values right now, and the others will be the same whenever the Babylon measures them.”

“So you’re basically . . . generating the keno numbers for Sunday night right now?”

“Yes.” She hit the “Enter” key. A stream of numbers showed up on-screen. She stared at the screen intently, memorizing the output. Ganesh had blessed her with an excellent memory.

“Those are it? The numbers?”

“Yes,” she said, keeping her eyes locked on the screen.

“You’re memorizing them?” he asked. “Why not just save them to a file or take a pic with your phone?”

“No.” She shook her head. “No digital trail. Everything is purely in my mind from here on out.”

“Ah, right. Makes sense.”

She closed her eyes and visualized the numbers. All twenty of them were clear in her mind. She opened her eyes to double-check against the screen, and she'd gotten them all correct. Perfect.

Prashant stirred his kheer. Uncharacteristic of him not to dig right in.

She turned the swivel chair toward her husband. "What's wrong, honey? You still seem unsettled."

He fiddled with the spoon. "Does it have to be *you* placing the bet?"

"Of course it does," she said. "They will know you as the man who set up their computer."

"Couldn't we just pay a college student to do it or something?"

She frowned and shook her head. "Accomplices add complications. I'm the only one we can trust to place the bet."

"Yeah, I guess so."

"It will be fine, husband. Eat your kheer."

"Okay." He took a bite and loosened up. Sweet food put him in a good mood.

At times he was a complicated man, but at other times he could be very simple. Finding those simple moments and bringing him joy was one of Sumi's greatest pleasures.

She smiled as she watched her husband eat.



Sumi sipped her lemonade in the keno lounge. The crowd was a little lighter than it would be at peak hours. Though midnight was still a very active time in a Vegas casino. The usual cacophony of dings, beeps, and buzzes filled the air.

She held the winning ticket—well, what would hopefully become the winning ticket—in her hand among a sheaf of other tickets that would surely lose. It would be suspicious if she bought only one.

Any number of things could go wrong. The long-term storage unit or the computer itself could have a software glitch that would require re-randomizing all the qbits. The settings for the coherence check could be wrong, and it might have already happened or not started yet. Then her numbers would be no more likely to win than any others.

To blend in as a tourist, she wore an even more traditional sari than usual. A little more Old World, with brass jewelry here and there. She took photos with her phone. What tourist wouldn't?

A peal of MIDI music filled the lounge to announce the next draw was about to begin. She glanced at the big display above the keno betting desk. She gripped the sheaf of tickets tighter.

The cheesy animated display showed a grid of keno numbers drawn in a cuneiform style—like a clay tablet from the ancient world. The numbers wiggled around in their boxes while a Babylonian archer beside the grid nocked an arrow and took aim. It was cartoonish and silly. If all went well, the first number would be a nine.

The animated archer loosed his arrow, and it flew in an arc over the grid. It struck the nine. Sumi breathed a sigh of relief.

After that, things proceeded according to plan. The rest of the numbers fell into place as expected. Sumi played the shocked-and-overjoyed-winner role and excitedly ran to the betting desk to report her win.

The win was large enough to warrant calling over the floor manager, who verified the ticket. And then the security tape was reviewed to make sure she was the one who had purchased it. They asked her to wait while they set up a photo shoot. The manager of the casino even came down.

Rutledge, the manager, shook Sumi's hand. "Congratulations," he said.

The pair stood in front of a bright sign that read **KENO 9-SPOT PROGRESSIVE JACKPOT: \$741,299**. A casino photographer took pictures.

“Thank you,” she said in a thick Indian accent.

“How did you pick the winning numbers?” asked Rutledge.

“I just pick random,” she said. “I only wanted a tickets to show the friends of mine in Mumbai. I never think I would win.”

“What do you plan to do with the money?”

She smiled. “I will give many of it to my family. They are poor. It will help them very a lot. And I will buy a big American car for driving with back in India.”

“That will be all for now,” Rutledge said to the photographer.

The photographer headed off, and Rutledge led Sumi to the elevator banks. “Ms. Singh, I’m sure this is all unfamiliar territory to you. I’ll help guide you through it.”

“You are important man,” Sumi said. “I do not need such an important man to help.”

“It’s my pleasure,” he said. “And it’s good publicity for the Babylon. A big win is the best advertising a casino can have.”

“Thank you, Mr. Rutledge,” she said. “What are we now to do?”

He pressed the elevator button. “First you’ll have to speak to a representative from the IRS. They’ll want their share right now. We’ll pay them their portion directly and issue you a cashier’s check for the rest. Or, if you prefer, we can give you cash.”

She laughed. “Oh no. Not cash. I cannot walk under so much cash.”

The doors opened and the pair entered. He swiped his key card on the reader. Various floor buttons that had been illuminated all shut off, and the highest button lit up. They rode to the top of the building without interruption.

He led her from the elevator bank through an empty mahogany office. “Sorry, my secretary is home right now,” he explained. “It’s almost one a.m., after all.”

“Of course,” she said.

He opened one of the ornate double doors to his office, and the lights turned on automatically. He beelined to the wet bar. “Can I offer you a drink?”

She followed him in. “I do not drink, thank you.”

“What a pity.”

“Where is IRS man?” she asked.

He gestured for her to sit on the plush leather couch. “Oh, he’s not here.” He poured himself two fingers of scotch.

“Why not? Does the government not want their money?”

“There won’t be any money.” He sipped his drink and picked up a folder from his desk. “I have very thorough security people. Did you know we do a full background check on anyone who wins more than one hundred thousand dollars?”

She pursed her lips. “I didn’t know that.”

“Your accent seems to have disappeared.” He opened the folder. “Do you have any idea how many Sumi Singhs there are in the world? A lot, believe me. But only one of them was a child genius who went on to earn PhDs in physics, mathematics, and quantum theory. Hell of a coincidence, don’t you think? A talented quantum physicist winning my nine-spot keno progressive four days after we install a quantum computer. Oh, and side note, you’re *married to the guy who installed it.*”

She looked away.

He sat at his desk. “Vegas gets a lot of smart people trying to cheat. *Very* smart people. Geniuses, scientists, electrical engineers, you name it. They come from all over the world to try their schemes. And they always have some angle we never thought of. Because they’re smart. Like you.”

He leaned forward. “You’re more intelligent than I could ever hope to be. I feel no shame in admitting it. But there’s no substitute for experience. You know all there is to know about quantum physics, but I have twenty years of running this casino. And Vegas has a hundred years of catching extremely smart cheaters.”

“You can’t prove anything,” she said. “And if you don’t pay me the money I won, I’ll take you to court.”

He raised his eyebrows. “Wow. You’re bold, I’ll grant you that.”

“This is a trivial sum of money compared to your casino’s profits,” she said. “It is not worth your time to pursue this.”

He raised his voice. “If someone stole a *nickel* from me, I’d spend a hundred thousand dollars tracking him down! It’s not about profit; it’s about protecting this establishment. There are a hundred other casinos out there, ready to take my customers. Any whiff of fraud or mismanagement here will blot our name and make us look second-rate. And there’s no room for second-rate on the Strip. People don’t come here for so-so casinos. They want the best.”

He took a breath and returned to his normal voice. “According to my IT manager—who is very upset right now, by the way—there’s something called entanglement that might be to blame? I can’t begin to comprehend what that’s all about, but he said our computer’s long-term storage unit must have been hooked up to the same computer as someone else’s. I’m guessing your hubby brought it to you before he brought it to us.”

“Theoretically, if that were to have happened,” she said, “the qbits on both drives would no longer be entangled, and there would be no way to see that they ever were.”

“See, there you go, being all smart again. Thinking like a quantum physicist.” Rutledge sloshed the scotch around in his glass. “I tend to think more like a criminal. Our long-term storage unit is in our vault. You’ve never been in our vault. But I bet there’s some skin cells of yours on it from when you handled it before.”

She widened her eyes.

“Yeah, the clever ones get tripped up by the simplest things. Anyway, the police are on their way.”

“What?”

“I could have security detain you, of course. But then tomorrow’s news would say ‘Vegas Billionaire Has Goons Bully a Confused Foreign Woman.’ Much better to lure you here and have the police pick you up.”

She bolted to her feet.

“That elevator only works with a key card. You’re not going anywhere.” He raised his glass to her. “Sure you don’t want a drink?”

“Give me a second . . . ,” she said. “I’m thinking.”

“About what?”

“A way out of this.”

“Um,” he said. “There isn’t a way out. The police will be here in a few minutes.”

“Then I have a few minutes to think.”

**“See, there you go, being all smart again.  
Thinking like a quantum physicist. I tend to  
think more like a criminal.”**



He shrugged. To his credit, he didn’t gloat. He didn’t seem to take pleasure in it at all. He wasn’t about revenge or money. He was about respect.

She furrowed her brow. This was getting somewhere.

His casino was his life. It was his baby. A billionaire like him didn’t need to oversee the day-to-day operations of a company. He could easily hire someone to do it and spend his life gallivanting around European ski slopes or whatever. A

man with his means could do anything he wanted. And what he wanted was to run this casino.

And to be respected. No, not quite. It wasn't about his ego. It was about the casino being respected. Why? Because without that respect, the business suffered. So it was all about the business success. And her scam had put that all at risk.

There it was. The answer.

“I have a proposal,” she said.

“Pardon?”

She sat back down and folded her hands on her lap. “You call off the police and pay me the winnings.”

“And why would I do that?”

“My husband will quit his job at QuanaTech, and the two of us will start a new company—one dedicated to making specialty quantum devices for the gambling industry. It makes perfect sense with his background on the business side and my expertise of the technology.”

“I'm still waiting for why I would do this.”

“It would cost more than our winnings to start a company,” she mused. “So you would have to be an anonymous angel investor.”

He laughed. “My God! Earlier when I said you were bold—that was an understatement. You're borderline insane.”

She pressed on. “Our new company will make quantum random-number generators. Our product will just be a box that makes a stream of truly random numbers via quantum properties and outputs them at a steady rate. No configuration. No operating system. Just a serial port.”

Rutledge raised his finger and opened his mouth, then stopped. He thought for a moment, then finally spoke. “Every casino would want those boxes. And they'd want hundreds of them. One for every video poker machine, every slot machine, and so on. It's an excellent business model with a huge addressable market.”



“Thank you.”

“I might fund a start-up with that in mind. But not with you. You’re still going to jail.”

“No, it’ll be with me.” She thought things through as she spoke—time was of the essence. Once the police arrived, it was all over. “With us, I mean. My husband and I.”

“You literally just tried to rob me.”

She nodded slowly. “Yes. So we’ve established I have a certain moral flexibility.”

“Why would I care about—”

She stood and paced. “We sell the boxes at a loss. Whatever it takes to get everyone buying them and beat any competition that crops up.” Her voice sped up. “Yes. That should get all the major casinos on board. And of course the boxes would be tamperproof. No, not just tamperproof. Literally sealed so no one can modify them.”

The phone on Rutledge’s desk buzzed. He pressed a button. “Yes?”

“Sir, LVPD are here,” came a voice through the speaker. “They say you called them?”

“Yes, send them up.” He terminated the call and looked back to Sumi. “Feel free to keep ranting.”

She knew from earlier that the elevator ride took about ninety seconds. She had that long remaining. She slapped both hands down on his desk. “At a prearranged time, a couple of years from now, all of the randomizer units will simultaneously fail. Because we’ll program them to do that from the start.”

He frowned. Was that a spark of interest? “Define ‘fail.’”

“They’ll all output a steady stream of zeroes. Most gambling machines using them will crash because their software doesn’t account for getting the same ‘random’ number every time. At the very least, they would shut down. Other systems might even remain online, giving the same result every use. That’s even worse—especially if it happens

to be a player-win. Every casino in town would be in utter chaos.”

He looked to the ceiling, realization dawning. “Except the Babylon.”

“Right! Not the Babylon.” She pointed at him. “Because you already have a different system in place. You can just say you never bothered to upgrade. Lucky you. Then what happens, Mr. Rutledge? What happens when the Babylon is the only casino in Vegas with functioning machines?”

“We get all the customers. Every last one.” He downed his scotch and spun his chair to face the cityscape. “And our competitors lose hundreds of millions of dollars.”

She crept around his desk. “It would take them time to retrofit all their machines,” she said. “They couldn’t go back to the old non-quantum randomizers. By then everyone will have quantum computers to crack pseudorandom-number generators. They’d have to set up a central quantum computer randomizer like you have.”

He pinched his chin. “The spike in demand for those systems would slow everyone down even more. We’d probably have a week, maybe two, of exclusive control over the entire machine-gaming market. Hmm.”

She stood beside him and looked out over the unwitting town. “Of course, well before that day, my husband and I will have arranged for new identities, and you will have paid us a large sum of money. Say, ten million dollars? A tiny fraction of what you’ll gain.”

He remained quiet.

“This is an opportunity, Mr. Rutledge. It comes with great risk but has the potential for a huge reward. I think you’re a gambler at heart. What do you say?”

The elevator dinged, and the doors opened. Two policemen walked through the reception area and into the office. One was young and wiry, while the other was at least twenty years older. The older officer, obviously the one in charge, said, “We got a call saying you needed us?”

Rutledge rotated his chair to face them.

He looked to Sumi, then back to the police. “Mrs. Singh here has just won over seven hundred thousand dollars. She’s new to the country. Can you please see to her protection when she returns to her hotel tonight?”

“Sure thing,” said the officer. “Congratulations, ma’am.”

Sumi breathed a sigh of relief. “Thanks, Officer. Mr. Rutledge, if it’s still available, I’ll take that drink now. Double gin and tonic with a heavy squeeze of lime?”

He smiled and headed to the wet bar. “It would be my pleasure.”

# **A NOTE FROM THE CURATOR OF THE FORWARD COLLECTION**

A year and a half ago, my partner and I were driving across the Rocky Mountains, not far from where I live. The aspens had just begun to turn, and the air was redolent with all the smells I associate with fall: incense, dirt, the start of decay. As we drove, we were debating some emerging technology I'd read about in *Scientific American* and circling around the larger topic of growing up in the bubble of rapid change and technological advancement. While a lot of it has been amazing, some of the change has come with effects we'd rather roll back.

How does anyone know at the moment of discovery where their work will ultimately lead?

Should we let that uncertainty stop forward momentum, or do we roll the dice and let the chips fall where they may?

How does it feel to change the world?

These questions intrigued me, so much so that I wrote a story about it. But my obsession didn't stop there—I also wanted to know what other writers would write when posed with the same questions.

And so this collection was born and filled with writers whose minds work in ways that fascinate me.

N. K. Jemisin (the Broken Earth trilogy) is writing fantasy and speculative fiction like you've never even fathomed. Paul Tremblay is the greatest horror novelist working today, and his novel *A Head Full of Ghosts* still gives me nightmares. Veronica Roth created an unforgettable world and populated it with amazing characters in her iconic Divergent trilogy. Andy Weir captured the imagination of the world and scienced the shit out of his already-a-classic *The Martian*. And Amor Towles, with *A Gentleman in Moscow*, has simply written one of the best novels I've ever read. I recommend it every day.

I asked these writers to be a part of a collection that explores the resounding effects of a pivotal technological moment, and to my great delight, they said yes. I knew they'd deliver the goods when it came time to write their stories, but I was not prepared for what an abundance of riches this collection would turn out to be.

I hope, once you've read these six mind-bending stories, that you'll agree.

*Blake Crouch*

*Durango, Colorado*

*May 3, 2019*

## ABOUT THE AUTHOR



*Photo © Aubrie Pick*

Andy Weir is the #1 *New York Times* bestselling author of *The Martian*, which was adapted into an Academy Award–nominated film directed by Ridley Scott. A devoted hobbyist of such subjects as relativistic physics and orbital mechanics, he’s also the author of *Artemis*. He lives in California.