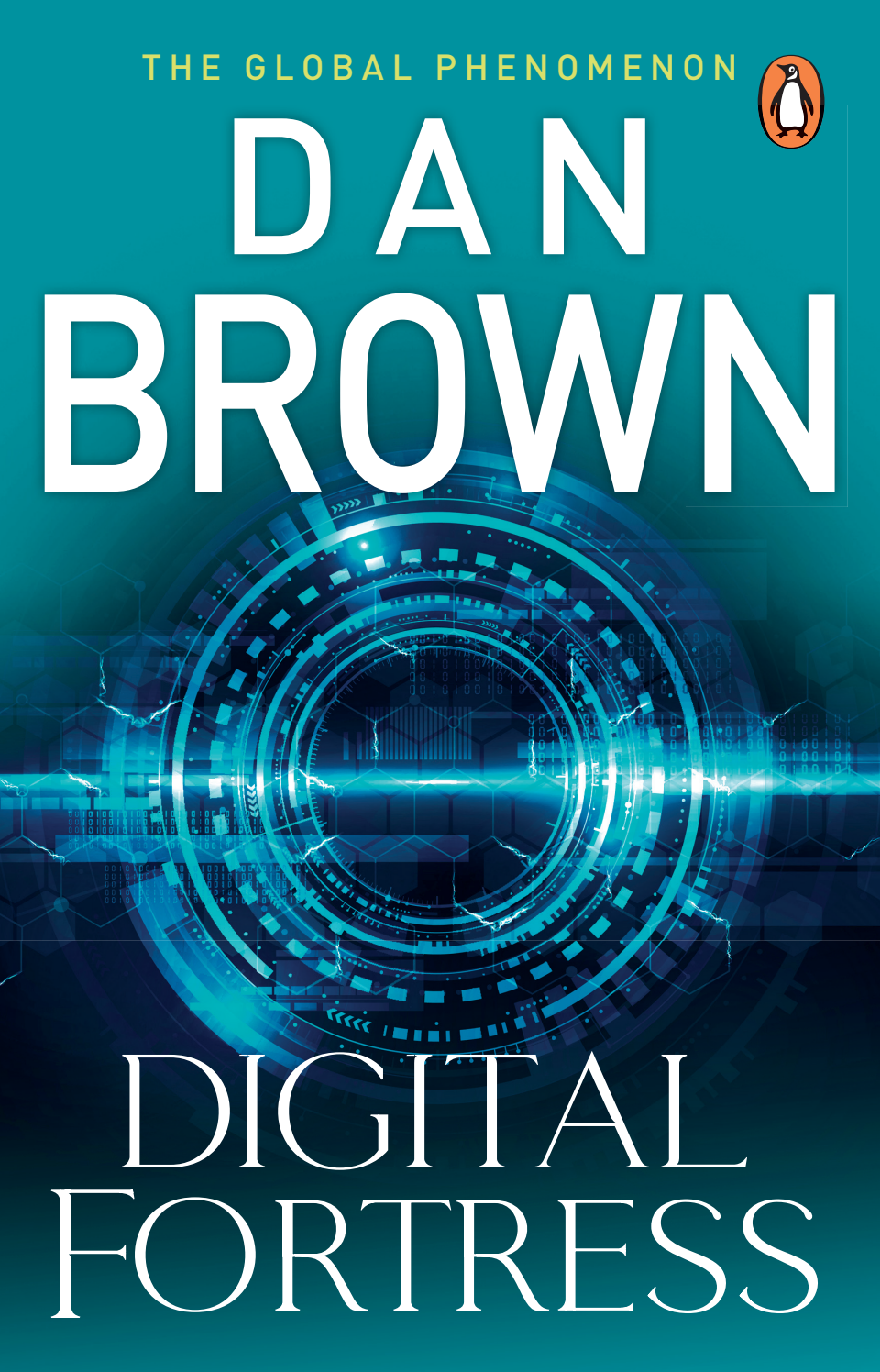
THE GLOBAL PHENOMENON

DAN BROWN



DIGITAL FORTRESS

DAN BROWN

is the bestselling author of *Digital Fortress*, *Deception Point*, *Angels & Demons*, *The Da Vinci Code*, *The Lost Symbol*, *Inferno*, *Origin* and *The Secret of Secrets*. Three of his Robert Langdon novels have been adapted for the screen by Ron Howard, starring Tom Hanks. They have all been international blockbusters.

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BY DAN BROWN

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An impossibly complex code threatens to obliterate the balance of world power forever . . .

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Washington Post

Deception Point

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'Thundering'
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Robert Langdon must unlock the secrets of one of Europe's oldest cities to save the woman he loves . . .

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Washington Post

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Guardian

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Entertainment Weekly

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'As engaging a hero as you could wish for'
Mail on Sunday

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For my parents . . .
my mentors and heroes

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PROLOGUE

PLAZA DE ESPAÑA
SEVILLE, SPAIN
11:00 A.M.

It is said that in death, all things become clear; Ensei Tankado now knew it was true. As he clutched his chest and fell to the ground in pain, he realized the horror of his mistake.

People appeared, hovering over him, trying to help. But Tankado did not want help – it was too late for that.

Trembling, he raised his left hand and held his fingers outward. *Look at my hand!* The faces around him stared, but he could tell they did not understand.

On his finger was an engraved golden ring. For an instant, the markings glimmered in the Andalusian sun. Ensei Tankado knew it was the last light he would ever see.

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CHAPTER 1

They were in the Smoky Mountains at their favorite bed-and-breakfast. David was smiling down at her. 'What do you say, gorgeous? Marry me?'

Looking up from their canopy bed, she knew he was the one. Forever. As she stared into his deep-green eyes, somewhere in the distance a deafening bell began to ring. It was pulling him away. She reached for him, but her arms clutched empty air.

It was the sound of the phone that fully awoke Susan Fletcher from her dream. She gasped, sat up in bed, and fumbled for the receiver. 'Hello?'

'Susan, it's David. Did I wake you?'

She smiled, rolling over in bed. 'I was just dreaming of you. Come over and play.'

He laughed. 'It's still dark out.'

'Mmm.' She moaned sensuously. 'Then *definitely* come over and play. We can sleep in before we head north.'

David let out a frustrated sigh. 'That's why I'm calling. It's about our trip. I've got to postpone.'

Susan was suddenly wide awake. 'What!'

'I'm sorry. I've got to leave town. I'll be back by

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tomorrow. We can head up first thing in the morning. We'll still have two days.'

'But I made reservations,' Susan said, hurt. 'I got our old room at Stone Manor.'

'I know, but—'

'Tonight was supposed to be *special* – to celebrate six months. You *do* remember we're engaged, don't you?'

'Susan.' He sighed. 'I really can't go into it now, they've got a car waiting. I'll call you from the plane and explain everything.'

'Plane?' she repeated. 'What's going on? Why would the university . . . ?'

'It's not the university. I'll phone and explain later. I've really got to go; they're calling for me. I'll be in touch. I promise.'

'David!' she cried. 'What's—'

But it was too late. David had hung up.

Susan Fletcher lay awake for hours waiting for him to call back. The phone never rang.

Later that afternoon Susan sat dejected in the tub. She submerged herself in the soapy water and tried to forget Stone Manor and the Smoky Mountains. *Where could he be?* she wondered. *Why hasn't he called?*

Gradually the water around her went from hot to lukewarm and finally to cold. She was about to get out when her cordless phone buzzed to life. Susan bolted upright, sloshing water on the floor as she grappled for the receiver she'd left on the sink.

'David?'

'It's Strathmore,' the voice replied.

Susan slumped. 'Oh.' She was unable to hide her disappointment. 'Good afternoon, Commander.'

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'Hoping for a younger man?' The voice chuckled.

'No, sir,' Susan said, embarrassed. 'It's not how it—'

'Sure it is.' He laughed. 'David Becker's a good man. Don't ever lose him.'

'Thank you, sir.'

The commander's voice turned suddenly stern. 'Susan, I'm calling because I need you in here. Pronto.'

She tried to focus. 'It's Saturday, sir. We don't usually—'

'I know,' he said calmly. 'It's an emergency.'

Susan sat up. *Emergency?* She had never heard the word cross Commander Strathmore's lips. *An emergency? In Crypto?* She couldn't imagine. 'Y-yes, sir.' She paused. 'I'll be there as soon as I can.'

'Make it sooner.' Strathmore hung up.

Susan Fletcher stood wrapped in a towel and dripped on the neatly folded clothes she'd set out the night before – hiking shorts, a sweater for the cool mountain evenings, and the new lingerie she'd bought for the nights. Depressed, she went to her closet for a clean blouse and skirt. *An emergency? In Crypto?*

As she went downstairs, Susan wondered how the day could get much worse.

She was about to find out.

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CHAPTER 2

Thirty thousand feet above a dead-calm ocean, David Becker stared miserably from the Learjet 60's small, oval window. He'd been told the phone on board was out of order, and he'd never had a chance to call Susan.

'What am I doing here?' he grumbled to himself. But the answer was simple – there were men to whom you just didn't say no.

'Mr Becker,' the loudspeaker crackled. 'We'll be arriving in half an hour.'

Becker nodded gloomily to the invisible voice. *Wonderful*. He pulled the shade and tried to sleep. But he could only think of her.

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CHAPTER 3

Susan's Volvo sedan rolled to a stop in the shadow of the ten-foot-high, barbed Cyclone fence. A young guard placed his hand on the roof.

'ID, please.'

Susan obliged and settled in for the usual half-minute wait. The officer ran her card through a computerized scanner. Finally he looked up. 'Thank you, Ms Fletcher.' He gave an imperceptible sign, and the gate swung open.

Half a mile ahead Susan repeated the entire procedure at an equally imposing electrified fence. *Come on, guys . . . I've only been through here a million times.*

As she approached the final checkpoint, a stocky sentry with two attack dogs and a machine gun glanced down at her license plate and waved her through. She followed Canine Road for another 250 yards and pulled into Employee Lot C. Unbelievable, she thought. *Twenty-six thousand employees and a twelve-billion-dollar budget; you'd think they could make it through the weekend without me*. Susan gunned the car into her reserved spot and killed the engine.

After crossing the landscaped terrace and entering

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the main building, she cleared two more internal checkpoints and finally arrived at the windowless tunnel that led to the new wing. A voice-scan booth blocked her entry.

NATIONAL SECURITY AGENCY (NSA)
CRYPTO FACILITY
AUTHORIZED PERSONNEL ONLY

The armed guard looked up. 'Afternoon, Ms Fletcher.'

Susan smiled tiredly. 'Hi, John.'

'Didn't expect you today.'

'Yeah, me neither.' She leaned toward the parabolic microphone. 'Susan Fletcher,' she stated clearly. The computer instantly confirmed the frequency concentrations in her voice, and the gate clicked open. She stepped through.

The guard admired Susan as she began her walk down the cement causeway. He noticed that her strong hazel eyes seemed distant today, but her cheeks had a flushed freshness, and her shoulder-length, auburn hair looked newly blown dry. Trailing her was the faint scent of Johnson's Baby Powder. His eyes fell the length of her slender torso – to her white blouse with the bra barely visible beneath, to her knee-length khaki skirt, and finally to her legs . . . Susan Fletcher's legs.

Hard to imagine they support a 170 IQ, he mused to himself.

He stared after her a long time. Finally he shook his head as she disappeared in the distance.

*

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As Susan reached the end of the tunnel, a circular, vaultlike door blocked her way. The enormous letters read: CRYPTO.

Sighing, she placed her hand inside the recessed cipher box and entered her five-digit PIN. Seconds later the twelve-ton slab of steel began to revolve. She tried to focus, but her thoughts reeled back to him.

David Becker. The only man she'd ever loved. The youngest full professor at Georgetown University and a brilliant foreign-language specialist, he was practically a celebrity in the world of academia. Born with an eidetic memory and a love of languages, he'd mastered six Asian dialects as well as Spanish, French, and Italian. His university lectures on etymology and linguistics were standing-room-only, and he invariably stayed late to answer a barrage of questions. He spoke with authority and enthusiasm, apparently oblivious to the adoring gazes of his star-struck coeds.

Becker was dark – a rugged, youthful thirty-five with sharp green eyes and a wit to match. His strong jaw and taut features reminded Susan of carved marble. Over six feet tall, Becker moved across a squash court faster than any of his colleagues could comprehend. After soundly beating his opponent, he would cool off by dousing his head in a drinking fountain and soaking his tuft of thick, black hair. Then, still dripping, he'd treat his opponent to a fruit shake and a bagel.

As with all young professors, David's university salary was modest. From time to time, when he needed to renew his squash club membership or restring his old Dunlop with gut, he earned extra money by doing translating work for government agencies in and around Washington. It was on one of those jobs that he'd met Susan.

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It was a crisp morning during fall break when Becker returned from a morning jog to his three-room faculty apartment to find his answering machine blinking. He downed a quart of orange juice as he listened to the playback. The message was like many he received – a government agency requesting his translating services for a few hours later that morning. The only strange thing was that Becker had never heard of the organization.

'They're called the National Security Agency,' Becker said, calling a few of his colleagues for background.

The reply was always the same. 'You mean the National Security *Council?'*

Becker checked the message. 'No. They said *Agency.* The NSA.'

'Never heard of 'em.'

Becker checked the GAO Directory, and it showed no listing either. Puzzled, Becker called one of his old squash buddies, an ex-political analyst turned research clerk at the Library of Congress. David was shocked by his friend's explanation.

Apparently, not only did the NSA exist, but it was considered one of the most influential government organizations in the world. It had been gathering global electronic intelligence data and protecting U.S. classified information for over half a century. Only 3 percent of Americans were even aware it existed.

'NSA,' his buddy joked, 'stands for "No Such Agency."'

With a mixture of apprehension and curiosity, Becker accepted the mysterious agency's offer. He drove the thirty-seven miles to their eighty-six-acre headquarters hidden discreetly in the wooded hills of

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Fort Meade, Maryland. After passing through endless security checks and being issued a six-hour, holographic guest pass, he was escorted to a plush research facility where he was told he would spend the afternoon providing 'blind support' to the Cryptography Division – an elite group of mathematical brainiacs known as the code-breakers.

For the first hour, the cryptographers seemed unaware Becker was even there. They hovered around an enormous table and spoke a language Becker had never heard. They spoke of stream ciphers, self-decimated generators, knapsack variants, zero knowledge protocols, unicity points. Becker observed, lost. They scrawled symbols on graph paper, pored over computer printouts, and continuously referred to the jumble of text on the overhead projector.

JHDJA3JKHDHMAD0/ERTWTJLW+JGJ328
5JHALSFNHKHHHFAF0HHDFGAF/FJ37WE
0HI934505S9DJFD2H/HHRTYFHLF893O3
95JSPJF2JO8901IHJ98YHFIO8OIEWRTO3
J0JR845HOR0Q+JTOEU4T0EF0E//0UJW
O8UYOIHO934JTPWFIAJERO90U4JR9GU
IVJP$DUW4H95PE8RTUGVJW3P4E/IKKC
MFFUERHFGVO0394IKJRMG+UNHVS90ER
IRK/O956Y7UOP0IKIOJP9F8760QWERQI

Eventually one of them explained what Becker had already surmised. The scrambled text was a code – a 'ciphertext' – groups of numbers and letters representing encrypted words. The cryptographers' job was to study the code and extract from it the original message, or 'cleartext.' The NSA had called Becker because they suspected the original message was

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written in Mandarin Chinese; he was to translate the symbols as the cryptographers decrypted them.

For two hours, Becker interpreted an endless stream of Mandarin symbols. But each time he gave them a translation, the cryptographers shook their heads in despair. Apparently the code was not making sense. Eager to help, Becker pointed out that all the characters they'd shown him had a common trait – they were also part of the Kanji language. Instantly the bustle in the room fell silent. The man in charge, a lanky chain-smoker named Morante, turned to Becker in disbelief.

'You mean these symbols have multiple meanings?'

Becker nodded. He explained that Kanji was a Japanese writing system based on modified Chinese characters. He'd been giving Mandarin translations because that's what they'd asked for.

'Jesus Christ.' Morante coughed. 'Let's try the Kanji.'

Like magic, everything fell into place.

The cryptographers were duly impressed, but nonetheless, they still made Becker work on the characters out of sequence. 'It's for your own safety,' Morante said. 'This way, you won't know what you're translating.'

Becker laughed. Then he noticed nobody else was laughing.

When the code finally broke, Becker had no idea what dark secrets he'd helped reveal, but one thing was for certain – the NSA took code-breaking seriously; the check in Becker's pocket was more than an entire month's university salary.

On his way back out through the series of security checkpoints in the main corridor, Becker's exit was

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blocked by a guard hanging up a phone. 'Mr Becker, wait here, please.'

'What's the problem?' Becker had not expected the meeting to take so long, and he was running late for his standing Saturday afternoon squash match.

The guard shrugged. 'Head of Crypto wants a word. She's on her way out now.'

'*She?*' Becker laughed. He had yet to see a female inside the NSA.

'Is that a problem for you?' a woman's voice asked from behind him.

Becker turned and immediately felt himself flush. He eyed the ID card on the woman's blouse. The head of the NSA's Cryptography Division was not only a woman, but an attractive woman at that.

'No,' Becker fumbled. 'I just . . .'

'Susan Fletcher.' The woman smiled, holding out her slender hand.

Becker took it. 'David Becker.'

'Congratulations, Mr Becker. I hear you did a fine job today. Might I chat with you about it?'

Becker hesitated. 'Actually, I'm in a bit of a rush at the moment.' He hoped spurning the world's most powerful intelligence agency wasn't a foolish act, but his squash match started in forty-five minutes, and he had a reputation to uphold: David Becker was never late for squash . . . class maybe, but *never* squash.

'I'll be brief.' Susan Fletcher smiled. 'Right this way, please.'

Ten minutes later, Becker was in the NSA's commissary enjoying a popover and cranberry juice with the NSA's lovely head cryptographer, Susan Fletcher. It quickly became evident to David that the thirty-eight-year-old's high-ranking position at the NSA was no

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fluke – she was one of the brightest women he had ever met. As they discussed codes and code-breaking, Becker found himself struggling to keep up – a new and exciting experience for him.

An hour later, after Becker had obviously missed his squash match and Susan had blatantly ignored three pages on the intercom, both of them had to laugh. There they were, two highly analytical minds, presumably immune to irrational infatuations – but somehow, while they sat there discussing linguistic morphology and pseudo-random number generators, they felt like a couple of teenagers – everything was fireworks.

Susan never did get around to the real reason she'd wanted to speak to David Becker – to offer him a trial post in their Asiatic Cryptography Division. It was clear from the passion with which the young professor spoke about teaching that he would never leave the university. Susan decided not to ruin the mood by talking business. She felt like a schoolgirl all over again; nothing was going to spoil it. And nothing did.

Their courtship was slow and romantic – stolen escapes whenever their schedules permitted, long walks through the Georgetown campus, late-night cappuccinos at Merlutti's, occasional lectures and concerts. Susan found herself laughing more than she'd ever thought possible. It seemed there was nothing David couldn't twist into a joke. It was a welcome release from the intensity of her post at the NSA.

One crisp, autumn afternoon they sat in the bleachers watching Georgetown soccer get pummeled by Rutgers.

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'What sport did you say you play?' Susan teased. 'Zucchini?'

Becker groaned. 'It's called *squash*.'

She gave him a dumb look.

'It's *like* zucchini,' he explained, 'but the court's smaller.'

Susan pushed him.

Georgetown's left wing sent a corner-kick sailing out of bounds, and a boo went up from the crowd. The defensemen hurried back downfield.

'How about you?' Becker asked. 'Play any sports?'

'I'm a black belt in StairMaster.'

Becker cringed. 'I prefer sports you can win.'

Susan smiled. 'Overachiever, are we?'

Georgetown's star defenseman blocked a pass, and there was a communal cheer in the stands. Susan leaned over and whispered in David's ear. 'Doctor.'

He turned and eyed her, lost.

'Doctor,' she repeated. 'Say the first thing that comes to mind.'

Becker looked doubtful. 'Word associations?'

'Standard NSA procedure. I need to know who I'm with.' She eyed him sternly. 'Doctor.'

Becker shrugged. 'Seuss.'

Susan gave him a frown. 'Okay, try this one . . . "kitchen."'

He didn't hesitate. 'Bedroom.'

Susan arched her eyebrows coyly. 'Okay, how about this . . . "cat."'

'Gut,' Becker fired back.

'Gut?'

'Yeah. Catgut. Squash racquet string of champions.'

'That's pleasant.' She groaned.

'Your diagnosis?' Becker inquired.

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Susan thought a minute. 'You're a childish, sexually frustrated squash fiend.'

Becker shrugged. 'Sounds about right.'

It went on like that for weeks. Over dessert at all-night diners Becker would ask endless questions.

Where had she learned mathematics?

How did she end up at the NSA?

How did she get so captivating?

Susan blushed and admitted she'd been a late bloomer. Lanky and awkward with braces through her late teens, Susan said her Aunt Clara had once told her God's apology for Susan's plainness was to give her brains. A premature apology, Becker thought.

Susan explained that her interest in cryptography had started in junior high school. The president of the computer club, a towering eighth grader named Frank Gutmann, typed her a love poem and encrypted it with a number-substitution scheme. Susan begged to know what it said. Frank flirtatiously refused. Susan took the code home and stayed up all night with a flashlight under her covers until she figured out the secret – every number represented a letter. She carefully deciphered the code and watched in wonder as the seemingly random digits turned magically into beautiful poetry. In that instant, she knew she'd fallen in love – codes and cryptography would become her life.

Almost twenty years later, after getting her master's in mathematics from Johns Hopkins and studying number theory on a full scholarship from MIT, she submitted her doctoral thesis, *Cryptographic Methods, Protocols, and Algorithms for Manual Applications.* Apparently her professor was not the only one who

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read it; shortly afterward, Susan received a phone call and a plane ticket from the NSA.

Everyone in cryptography knew about the NSA; it was home to the best cryptographic minds on the planet. Each spring, as the private-sector firms descended on the brightest new minds in the workforce and offered obscene salaries and stock options, the NSA watched carefully, selected their targets, and then simply stepped in and doubled the best standing offer. What the NSA wanted, the NSA bought. Trembling with anticipation, Susan flew to Washington's Dulles International Airport where she was met by an NSA driver, who whisked her off to Fort Meade.

There were forty-one others who had received the same phone call that year. At twenty-eight, Susan was the youngest. She was also the only female. The visit turned out to be more of a public relations bonanza and a barrage of intelligence testing than an informational session. In the week that followed, Susan and six others were invited back. Although hesitant, Susan returned. The group was immediately separated. They underwent individual polygraph tests, background searches, handwriting analyses, and endless hours of interviews, including taped inquiries into their sexual orientations and practices. When the interviewer asked Susan if she'd ever engaged in sex with animals, she almost walked out, but somehow the mystery carried her through – the prospect of working on the cutting edge of code theory, entering 'The Puzzle Palace,' and becoming a member of the most secretive club in the world – the National Security Agency.

Becker sat riveted by her stories. 'They actually asked you if you'd had sex with animals?'

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Susan shrugged. 'Part of the routine background check.'

'Well . . .' Becker fought off a grin. 'What did you say?'

She kicked him under the table. 'I told them no!' Then she added, 'And until last night, it was true.'

In Susan's eyes, David was as close to perfect as she could imagine. He only had one unfortunate quality: Every time they went out, he insisted on picking up the check. Susan hated seeing him lay down a full day's salary on dinner for two, but Becker was immovable. Susan learned not to protest, but it still bothered her. *I make more money than I know what to do with*, she thought. *I should be paying*.

Nonetheless, Susan decided that aside from David's outdated sense of chivalry, he was ideal. He was compassionate, smart, funny, and best of all, he had a sincere interest in her work. Whether it was during trips to the Smithsonian, bike rides, or burning spaghetti in Susan's kitchen, David was perpetually curious. Susan answered what questions she could and gave David the general, unclassified overview of the National Security Agency. What David heard enthralled him.

Founded by President Truman at 12:01 A.M. on November 4, 1952, the NSA had been the most clandestine intelligence agency in the world for almost fifty years. The NSA's seven-page inception doctrine laid out a very concise agenda: to protect U.S. government communications and to intercept the communications of foreign powers.

The roof of the NSA's main operations building was littered with over five hundred antennas, including

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two large radomes that looked like enormous golf balls. The building itself was mammoth – over two million square feet, twice the size of CIA headquarters. Inside were eight million feet of telephone wire and eighty thousand square feet of permanently sealed windows.

Susan told David about COMINT, the agency's global reconnaissance division – a mind-boggling collection of listening posts, satellites, spies, and wiretaps around the globe. Thousands of communiqués and conversations were intercepted every day, and they were all sent to the NSA's analysts for decryption. The FBI, CIA, and U.S. foreign policy advisors all depended on the NSA's intelligence to make their decisions.

Becker was mesmerized. 'And code-breaking? Where do *you* fit in?'

Susan explained how the intercepted transmissions often originated from dangerous governments, hostile factions, and terrorist groups, many of whom were inside U.S. borders. Their communications were usually encoded for secrecy in case they ended up in the wrong hands – which, thanks to COMINT, they usually did. Susan told David her job was to study the codes, break them by hand, and furnish the NSA with the deciphered messages. This was not entirely true.

Susan felt a pang of guilt over lying to her new love, but she had no choice. A few years ago it would have been accurate, but things had changed at the NSA. The whole world of cryptography had changed. Susan's new duties were classified, even to many in the highest echelons of power.

'Codes,' Becker said, fascinated. 'How do you know where to start? I mean . . . how do you break them?'

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Susan smiled. 'You of all people should know. It's like studying a foreign language. At first the text looks like gibberish, but as you learn the rules defining its structure, you can start to extract meaning.'

Becker nodded, impressed. He wanted to know more.

With Merlutti's napkins and concert programs as her chalkboard, Susan set out to give her charming new pedagogue a minicourse in cryptography. She began with Julius Caesar's 'perfect square' cipher box.

Caesar, she explained, was the first code-writer in history. When his foot-messengers started getting ambushed and his secret communiqués stolen, he devised a rudimentary way to encrypt his directives. He rearranged the text of his messages such that the correspondence looked senseless. Of course, it was not. Each message always had a letter-count that was a perfect square – sixteen, twenty-five, one hundred – depending on how much Caesar needed to say. He secretly informed his officers that when a random message arrived, they should transcribe the text into a square grid. If they did, and read top-to-bottom, a secret message would magically appear.

Over time Caesar's concept of rearranging text was adopted by others and modified to become more difficult to break. The pinnacle of noncomputer-based encryption came during World War II. The Nazis built a baffling encryption machine named Enigma. The device resembled an old-fashioned typewriter with brass interlocking rotors that revolved in intricate ways and shuffled cleartext into confounding arrays of seemingly senseless character groupings. Only by having another Enigma machine, calibrated the exact same way, could the recipient break the code.

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Becker listened, spellbound. The teacher had become the student.

One night, at a university performance of *The Nutcracker,* Susan gave David his first basic code to break. He sat through the entire intermission, pen in hand, puzzling over the eleven-letter message:

HL FKZC VD LDS

Finally, just as the lights dimmed for the second half, he got it. To encode, Susan had simply replaced each letter of her message with the letter preceding it in the alphabet. To decrypt the code, all Becker had to do was shift each letter one space forward in the alphabet – 'A' became 'B,' 'B' became 'C,' and so on. He quickly shifted the remaining letters. He never imagined four little syllables could make him so happy:

IM GLAD WE MET

He quickly scrawled his response and handed it to her:

LD SNN

Susan read it and beamed.

Becker had to laugh; he was thirty-five years old, and his heart was doing backflips. He'd never been so attracted to a woman in his life. Her delicate European features and soft brown eyes reminded him of an ad for Estée Lauder. If Susan's body had been lanky and awkward as a teenager, it sure wasn't now. Somewhere along the way, she had developed a willowy grace – slender and tall with full, firm breasts

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and a perfectly flat abdomen. David often joked that she was the first swimsuit model he'd ever met with a doctorate in applied mathematics and number theory. As the months passed, they both started to suspect they'd found something that could last a lifetime.

They'd been together almost two years when, out of the blue, David proposed to her. It was on a weekend trip to the Smoky Mountains. They were lying on a big canopy bed at Stone Manor. He had no ring – he just blurted it out. That's what she loved about him – he was so spontaneous. She kissed him long and hard. He took her in his arms and slipped off her nightgown.

'I'll take that as a yes,' he said, and they made love all night by the warmth of the fire.

That magical evening had been six months ago – before David's unexpected promotion to chairman of the Modern Language Department. Their relationship had been in a downhill slide ever since.

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CHAPTER 4

The Crypto door beeped once, waking Susan from her depressing reverie. The door had rotated past its fully open position and would be closed again in five seconds, having made a complete 360-degree rotation. Susan gathered her thoughts and stepped through the opening. A computer made note of her entry.

Although she had practically lived in Crypto since its completion three years ago, the sight of it still amazed her. The main room was an enormous circular chamber that rose five stories. Its transparent, domed ceiling towered 120 feet at its central peak. The Plexiglas cupola was embedded with a polycarbonate mesh – a protective web capable of withstanding a two-megaton blast. The screen filtered the sunlight into delicate lacework across the walls. Tiny particles of dust drifted upward in wide unsuspecting spirals – captives of the dome's powerful deionizing system.

The room's sloping sides arched broadly at the top and then became almost vertical as they approached eye level. Then they became subtly translucent and graduated to an opaque black as they reached the floor – a shimmering expanse of polished black tile that

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shone with an eerie luster, giving one the unsettling sensation that the floor was transparent. Black ice.

Pushing through the center of the floor like the tip of a colossal torpedo was the machine for which the dome had been built. Its sleek black contour arched twenty-three feet in the air before plunging back into the floor below. Curved and smooth, it was as if an enormous killer whale had been frozen midbreach in a frigid sea.

This was TRANSLTR, the single most expensive piece of computing equipment in the world – a machine the NSA swore did not exist.

Like an iceberg, the machine hid 90 percent of its mass and power deep beneath the surface. Its secret was locked in a ceramic silo that went six stories straight down – a rocketlike hull surrounded by a winding maze of catwalks, cables, and hissing exhaust from the freon cooling system. The power generators at the bottom droned in a perpetual low-frequency hum that gave the acoustics in Crypto a dead, ghostlike quality.

TRANSLTR, like all great technological advancements, had been a child of necessity. During the 1980s, the NSA witnessed a revolution in telecommunications that would change the world of intelligence reconnaissance forever – public access to the Internet. More specifically, the arrival of E-mail.

Criminals, terrorists, and spies had grown tired of having their phones tapped and immediately embraced this new means of global communication. E-mail had the security of conventional mail and the speed of the telephone. Since the transfers traveled through underground fiber-optic lines and were never

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transmitted into the airwaves, they were entirely intercept-proof – at least that was the perception.

In reality, intercepting E-mail as it zipped across the Internet was child's play for the NSA's techno-gurus. The Internet was not the new home computer revelation that most believed. It had been created by the Department of Defense three decades earlier – an enormous network of computers designed to provide secure government communication in the event of nuclear war. The eyes and ears of the NSA were old Internet pros. People conducting illegal business via E-mail quickly learned their secrets were not as private as they'd thought. The FBI, DEA, IRS, and other U.S. law enforcement agencies – aided by the NSA's staff of wily hackers – enjoyed a tidal wave of arrests and convictions.

Of course, when the computer users of the world found out the U.S. government had open access to their E-mail communications, a cry of outrage went up. Even pen pals, using E-mail for nothing more than recreational correspondence, found the lack of privacy unsettling. Across the globe, entrepreneurial programmers began working on a way to keep E-mail more secure. They quickly found one and public-key encryption was born.

Public-key encryption was a concept as simple as it was brilliant. It consisted of easy-to-use, home-computer software that scrambled personal E-mail messages in such a way that they were totally unreadable. A user could write a letter and run it through the encryption software, and the text would come out the other side looking like random nonsense – totally illegible – a code. Anyone intercepting the transmission found only an unreadable garble on the screen.

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The only way to unscramble the message was to enter the sender's 'pass-key' – a secret series of characters that functioned much like a PIN number at an automatic teller. The pass-keys were generally quite long and complex; they carried all the information necessary to instruct the encryption algorithm exactly what mathematical operations to follow to re-create the original message.

A user could now send E-mail in confidence. Even if the transmission was intercepted, only those who were given the key could ever decipher it.

The NSA felt the crunch immediately. The codes they were facing were no longer simple substitution ciphers crackable with pencil and graph paper – they were computer-generated hash functions that employed chaos theory and multiple symbolic alphabets to scramble messages into seemingly hopeless randomness.

At first, the pass-keys being used were short enough for the NSA's computers to 'guess.' If a desired pass-key had ten digits, a computer was programmed to try every possibility between 0000000000 and 9999999999. Sooner or later the computer hit the correct sequence. This method of trial-and-error guessing was known as 'brute force attack.' It was time-consuming but mathematically guaranteed to work.

As the world got wise to the power of brute-force code-breaking, the pass-keys started getting longer and longer. The computer time needed to 'guess' the correct key grew from weeks to months and finally to years.

By the 1990s, pass-keys were over fifty characters long and employed the full 256-character ASCII

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alphabet of letters, numbers, and symbols. The number of different possibilities was in the neighborhood of 10^{120} – one with 120 zeros after it. Correctly guessing a pass-key was as mathematically unlikely as choosing the correct grain of sand from a three-mile beach. It was estimated that a successful brute-force attack on a standard sixty-four-bit key would take the NSA's fastest computer – the top-secret Cray/Josephson II – over nineteen years to break. By the time the computer guessed the key and broke the code, the contents of the message would be irrelevant.

Caught in a virtual intelligence blackout, the NSA passed a top-secret directive that was endorsed by the President of the United States. Buoyed by federal funds and a carte blanche to do whatever was necessary to solve the problem, the NSA set out to build the impossible: the world's first universal code-breaking machine.

Despite the opinion of many engineers that the newly proposed code-breaking computer was impossible to build, the NSA lived by its motto: Everything is possible. The impossible just takes longer.

Five years, half a million man-hours, and $1.9 billion later, the NSA proved it once again. The last of the three million stamp-size processors was hand-soldered in place, the final internal programming was finished, and the ceramic shell was welded shut. TRANSLTR had been born.

Although the secret internal workings of TRANSLTR were the product of many minds and were not fully understood by any one individual, its basic principle was simple: Many hands make light work.

Its three million processors would all work in

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parallel – counting upward at blinding speed, trying every new permutation as they went. The hope was that even codes with unthinkably colossal pass-keys would not be safe from TRANSLTR's tenacity. This multibillion-dollar masterpiece would use the power of parallel processing as well as some highly classified advances in cleartext assessment to guess pass-keys and break codes. It would derive its power not only from its staggering number of processors but also from new advances in quantum computing – an emerging technology that allowed information to be stored as quantum-mechanical states rather than solely as binary data.

The moment of truth came on a blustery Thursday morning in October. The first live test. Despite uncertainty about how fast the machine would be, there was one thing on which the engineers agreed – if the processors all functioned in parallel, TRANSLTR would be powerful. The question was *how* powerful.

The answer came twelve minutes later. There was a stunned silence from the handful in attendance when the printout sprang to life and delivered the cleartext – the broken code. TRANSLTR had just located a sixty-four-character key in a little over ten minutes, almost a million times faster than the two decades it would have taken the NSA's second-fastest computer.

Led by the deputy director of operations, Commander Trevor J. Strathmore, the NSA's Office of Production had triumphed. TRANSLTR was a success. In the interest of keeping their success a secret, Commander Strathmore immediately leaked information that the project had been a complete failure. All the activity in the Crypto wing was supposedly an attempt to salvage their $2 billion fiasco. Only the

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NSA elite knew the truth – TRANSLTR was cracking hundreds of codes every day.

With word on the street that computer-encrypted codes were entirely unbreakable – even by the all-powerful NSA – the secrets poured in. Drug lords, terrorists, and embezzlers alike – weary of having their cellular phone transmissions intercepted – were turning to the exciting new medium of encrypted E-mail for instantaneous global communications. Never again would they have to face a grand jury and hear their own voice rolling off tape, proof of some long-forgotten cellular phone conversation plucked from the air by an NSA satellite.

Intelligence gathering had never been easier. Codes intercepted by the NSA entered TRANSLTR as totally illegible ciphers and were spat out minutes later as perfectly readable cleartext. No more secrets.

To make their charade of incompetence complete, the NSA lobbied fiercely against all new computer encryption software, insisting it crippled them and made it impossible for lawmakers to catch and prosecute the criminals. Civil rights groups rejoiced, insisting the NSA shouldn't be reading their mail anyway. Encryption software kept rolling off the presses. The NSA had lost the battle – exactly as it had planned. The entire electronic global community had been fooled . . . or so it seemed.

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CHAPTER 5

Where is everyone? Susan wondered as she crossed the deserted Crypto floor. *Some emergency.*

Although most NSA departments were fully staffed seven days a week, Crypto was generally quiet on Saturdays. Cryptographic mathematicians were by nature high-strung workaholics, and there existed an unwritten rule that they take Saturdays off except in emergencies. Code-breakers were too valuable a commodity at the NSA to risk losing them to burnout.

As Susan traversed the floor, TRANSLTR loomed to her right. The sound of the generators eight stories below sounded oddly ominous today. Susan never liked being in Crypto during off hours. It was like being trapped alone in a cage with some grand, futuristic beast. She quickly made her way toward the commander's office.

Strathmore's glass-walled workstation, nicknamed 'the fishbowl' for its appearance when the drapes were open, stood high atop a set of catwalk stairs on the back wall of Crypto. As Susan climbed the grated steps, she gazed upward at Strathmore's thick, oak door. It bore the NSA seal – a bald eagle fiercely

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clutching an ancient skeleton key. Behind that door sat one of the greatest men she'd ever met.

Commander Strathmore, the fifty-six-year-old deputy director of operations, was like a father to Susan. He was the one who'd hired her, and he was the one who'd made the NSA her home. When Susan joined the NSA over a decade ago, Strathmore was heading the Crypto Development Division – a training ground for new cryptographers – new *male* cryptographers. Although Strathmore never tolerated the hazing of anyone, he was especially protective of his sole female staff member. When accused of favoritism, he simply replied with the truth: Susan Fletcher was one of the brightest young recruits he'd ever seen, and he had no intention of losing her to sexual harassment. One of the senior cryptographers foolishly decided to test Strathmore's resolve.

One morning during her first year, Susan dropped by the new cryptographers' lounge to get some paperwork. As she left, she noticed a picture of herself on the bulletin board. She almost fainted in embarrassment. There she was, reclining on a bed and wearing only panties.

As it turned out, one of the cryptographers had digitally scanned a photo from a pornographic magazine and edited Susan's head onto someone else's body. The effect had been quite convincing.

Unfortunately for the cryptographer responsible, Commander Strathmore did not find the stunt even remotely amusing. Two hours later, a landmark memo went out:

EMPLOYEE CARL AUSTIN TERMINATED FOR INAPPROPRIATE CONDUCT

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From that day on, nobody messed with her; Susan Fletcher was Commander Strathmore's golden girl.

But Strathmore's young cryptographers were not the only ones who learned to respect him; early in his career Strathmore made his presence known to his superiors by proposing a number of unorthodox and highly successful intelligence operations. As he moved up the ranks, Trevor Strathmore became known for his cogent, reductive analyses of highly complex situations. He seemed to have an uncanny ability to see past the moral perplexities surrounding the NSA's difficult decisions and to act without remorse in the interest of the common good.

There was no doubt in anyone's mind that Strathmore loved his country. He was known to his colleagues as a patriot and a visionary . . . a decent man in a world of lies.

In the years since Susan's arrival at the NSA, Strathmore had skyrocketed from head of Crypto Development to second-in-command of the entire NSA. Now only one man outranked Commander Strathmore there – Director Leland Fontaine, the mythical overlord of the Puzzle Palace – never seen, occasionally heard, and eternally feared. He and Strathmore seldom saw eye to eye, and when they met, it was like the clash of the titans. Fontaine was a giant among giants, but Strathmore didn't seem to care. He argued his ideas to the director with all the restraint of an impassioned boxer. Not even the President of the United States dared challenge Fontaine the way Strathmore did. One needed political immunity to do that – or, in Strathmore's case, political indifference.

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Susan arrived at the top of the stairs. Before she could knock, Strathmore's electronic door lock buzzed. The door swung open, and the commander waved her in.

'Thanks for coming, Susan. I owe you one.'

'Not at all.' She smiled as she sat opposite his desk.

Strathmore was a rangy, thick-fleshed man whose muted features somehow disguised his hard-nosed efficiency and demand for perfection. His gray eyes usually suggested a confidence and discretion born from experience, but today they looked wild and unsettled.

'You look beat,' Susan said.

'I've been better.' Strathmore sighed.

I'll say, she thought.

Strathmore looked as bad as Susan had ever seen him. His thinning gray hair was disheveled, and even in the room's crisp air-conditioning, his forehead was beaded with sweat. He looked like he'd slept in his suit. He was sitting behind a modern desk with two recessed keypads and a computer monitor at one end. It was strewn with computer printouts and looked like some sort of alien cockpit propped there in the center of his curtained chamber.

'Tough week?' she inquired.

Strathmore shrugged. 'The usual. The EFF's all over me about civilian privacy rights again.'

Susan chuckled. The EFF, or Electronics Frontier Foundation, was a worldwide coalition of computer users who had founded a powerful civil liberties coalition aimed at supporting free speech on-line and educating others to the realities and dangers of living in an electronic world. They were constantly lobbying

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against what they called 'the Orwellian eavesdropping capabilities of government agencies' – particularly the NSA. The EFF was a perpetual thorn in Strathmore's side.

'Sounds like business as usual,' she said. 'So what's this big emergency you got me out of the tub for?'

Strathmore sat a moment, absently fingering the computer trackball embedded in his desktop. After a long silence, he caught Susan's gaze and held it. 'What's the longest you've ever seen TRANSLTR take to break a code?'

The question caught Susan entirely off guard. It seemed meaningless. *This is what he called me in for?*

'Well . . .' She hesitated. 'We hit a COMINT intercept a few months ago that took about an hour, but it had a ridiculously long key – ten thousand bits or something like that.'

Strathmore grunted. 'An hour, huh? What about some of the boundary probes we've run?'

Susan shrugged. 'Well, if you include diagnostics, it's obviously longer.'

'How *much* longer?'

Susan couldn't imagine what Strathmore was getting at. 'Well, sir, I tried an algorithm last March with a segmented million-bit key. Illegal looping functions, cellular automata, the works. TRANSLTR still broke it.'

'How long?'

'Three hours.'

Strathmore arched his eyebrows. 'Three hours? That long?'

Susan frowned, mildly offended. Her job for the last three years had been to fine-tune the most secret computer in the world; most of the programming that

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made TRANSLTR so fast was hers. A million-bit key was hardly a realistic scenario.

'Okay,' Strathmore said. 'So even in extreme conditions, the longest a code has ever survived inside TRANSLTR is about three hours?'

Susan nodded. 'Yeah. More or less.'

Strathmore paused as if afraid to say something he might regret. Finally he looked up. 'TRANSLTR's hit something . . .' He stopped.

Susan waited. 'More than three hours?'

Strathmore nodded.

She looked unconcerned. 'A new diagnostic? Something from the Sys-Sec Department?'

Strathmore shook his head. 'It's an outside file.'

Susan waited for the punch line, but it never came. 'An outside file? You're joking, right?'

'I wish. I queued it last night around eleven thirty. It hasn't broken yet.'

Susan's jaw dropped. She looked at her watch and then back at Strathmore. 'It's *still* going? Over fifteen hours?'

Strathmore leaned forward and rotated his monitor toward Susan. The screen was black except for a small, yellow text box blinking in the middle.

TIME ELAPSED: 15:09:33
AWAITING KEY: _____

Susan stared in amazement. It appeared TRANSLTR had been working on one code for over fifteen hours. She knew the computer's processors auditioned thirty million keys per second – one hundred billion per hour. If TRANSLTR was still counting, that meant the key had to be enormous –

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over ten billion digits long. It was absolute insanity.

'It's impossible!' she declared. 'Have you checked for error flags? Maybe TRANSLTR hit a glitch and—'

'The run's clean.'

'But the pass-key must be huge!'

Strathmore shook his head. 'Standard commercial algorithm. I'm guessing a sixty-four-bit key.'

Mystified, Susan looked out the window at TRANSLTR below. She knew from experience that it could locate a sixty-four-bit key in under ten minutes. 'There's got to be some explanation.'

Strathmore nodded. 'There is. You're not going to like it.'

Susan looked uneasy. 'Is TRANSLTR malfunctioning?'

'TRANSLTR's fine.'

'Have we got a virus?'

Strathmore shook his head. 'No virus. Just hear me out.'

Susan was flabbergasted. TRANSLTR had never hit a code it couldn't break in under an hour. Usually the cleartext was delivered to Strathmore's printout module within minutes. She glanced at the high-speed printer behind his desk. It was empty.

'Susan,' Strathmore said quietly. 'This is going to be hard to accept at first, but just listen a minute.' He chewed his lip. 'This code that TRANSLTR's working on – it's unique. It's like nothing we've ever seen before.' Strathmore paused, as if the words were hard for him to say. 'This code is unbreakable.'

Susan stared at him and almost laughed. *Unbreakable? What was THAT supposed to mean?* There was no such thing as an unbreakable code – some took longer than others, but every code was breakable. It

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was mathematically guaranteed that sooner or later TRANSLTR would guess the right key. 'I *beg* your pardon?'

'The code's unbreakable,' he repeated flatly.

Unbreakable? Susan couldn't believe the word had been uttered by a man with twenty-seven years of code analysis experience.

'Unbreakable, sir?' she said uneasily. 'What about the Bergofsky Principle?'

Susan had learned about the Bergofsky Principle early in her career. It was a cornerstone of brute-force technology. It was also Strathmore's inspiration for building TRANSLTR. The principle clearly stated that if a computer tried enough keys, it was mathematically guaranteed to find the right one. A code's security was not that its pass-key was unfindable but rather that most people didn't have the time or equipment to try.

Strathmore shook his head. 'This code's different.'

'Different?' Susan eyed him askance. *An unbreakable code is a mathematical impossibility! He knows that!*

Strathmore ran a hand across his sweaty scalp. 'This code is the product of a brand-new encryption algorithm – one we've never seen before.'

Now Susan was even more doubtful. Encryption algorithms were just mathematical formulas, recipes for scrambling text into code. Mathematicians and programmers created new algorithms every day. There were hundreds of them on the market – PGP, Diffie-Hellman, ZIP, IDEA, El Gamal. TRANSLTR broke all of their codes every day, no problem. To TRANSLTR all codes looked identical, regardless of which algorithm wrote them.

'I don't understand,' she argued. 'We're not talking

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about reverse-engineering some complex function, we're talking brute force. PGP, Lucifer, DSA – it doesn't matter. The algorithm generates a key it thinks is secure, and TRANSLTR keeps guessing until it finds it.'

Strathmore's reply had the controlled patience of a good teacher. 'Yes, Susan, TRANSLTR will *always* find the key – even if it's huge.' He paused a long moment. 'Unless . . .'

Susan wanted to speak, but it was clear Strathmore was about to drop his bomb. *Unless what?*

'Unless the computer doesn't know when it's broken the code.'

Susan almost fell out of her chair. 'What!'

'Unless the computer guesses the correct key but just keeps guessing because it doesn't realize it found the right key.' Strathmore looked bleak. 'I think this algorithm has got a rotating cleartext.'

Susan gaped.

The notion of a rotating cleartext function was first put forth in an obscure, 1987 paper by a Hungarian mathematician, Josef Harne. Because brute-force computers broke codes by examining cleartext for identifiable word patterns, Harne proposed an encryption algorithm that, in addition to encrypting, shifted decrypted cleartext over a time variant. In theory, the perpetual mutation would ensure that the attacking computer would never locate recognizable word patterns and thus never know when it had found the proper key. The concept was somewhat like the idea of colonizing Mars – fathomable on an intellectual level, but, at present, well beyond human ability.

'Where did you get this thing?' she demanded.

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The commander's response was slow. 'A public sector programmer wrote it.'

'What?' Susan collapsed back in her chair. 'We've got the best programmers in the world downstairs! All of us working together have never even come *close* to writing a rotating cleartext function. Are you trying to tell me some punk with a PC figured out how to do it?'

Strathmore lowered his voice in an apparent effort to calm her. 'I wouldn't call this guy a punk.'

Susan wasn't listening. She was convinced there had to be some other explanation: A glitch. A virus. Anything was more likely than an unbreakable code.

Strathmore eyed her sternly. 'One of the most brilliant cryptographic minds of all time wrote this algorithm.'

Susan was more doubtful than ever; the most brilliant cryptographic minds of all time were in her department, and she certainly would have heard about an algorithm like this.

'Who?' she demanded.

'I'm sure you can guess,' Strathmore said. 'He's not too fond of the NSA.'

'Well, that narrows it down!' she snapped sarcastically.

'He worked on the TRANSLTR project. He broke the rules. Almost caused an intelligence nightmare. I deported him.'

Susan's face was blank only an instant before going white. 'Oh my God . . .'

Strathmore nodded. 'He's been bragging all year about his work on a brute-force-resistant algorithm.'

'B-but . . .' Susan stammered. 'I thought he was bluffing. He actually *did* it?'

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'He did. The ultimate unbreakable code-writer.'

Susan was silent a long moment. 'But . . . that means . . .'

Strathmore looked her dead in the eye. 'Yes. Ensei Tankado just made TRANSLTR obsolete.'

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CHAPTER 6

Although Ensei Tankado was not alive during the Second World War, he carefully studied everything about it – particularly about its culminating event, the blast in which 100,000 of his countrymen were incinerated by an atomic bomb.

Hiroshima, 8:15 A.M. August 6, 1945 – a vile act of destruction. A senseless display of power by a country that had already won the war. Tankado had accepted all that. But what he could never accept was that the bomb had robbed him of ever knowing his mother. She had died giving birth to him – complications brought on by the radiation poisoning she'd suffered so many years earlier.

In 1945, before Ensei was born, his mother, like many of her friends, traveled to Hiroshima to volunteer in the burn centers. It was there that she became one of the hibakusha – the radiated people. Nineteen years later, at the age of thirty-six, as she lay in the delivery room bleeding internally, she knew she was finally going to die. What she did not know was that death would spare her the final horror – her only child was to be born deformed.

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