THE LAST LOTTERY

Operation Heisenberg

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An opening excerpt

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CHAPTER ONE

The Numbers

Vienna — Friday, 3 September 2027

The rain arrived over Vienna at twenty past five that afternoon, coming in from the west across the Wienerwald, and by half past it had reached the Ninth District and begun the slow, patient work of polishing the streets.

Frederick Marshall did not notice it begin. He had his back to the window. He was sixty-eight years old, he had been retired for seventeen months, and he was sitting in a chair he had bought in 1991 in front of an apparatus he had built himself, looking at seven numbers that had no business existing.

They were not, in themselves, remarkable numbers.

8 — 17 — 26 — 34 — 49

And beneath them, in a separate line:

4 — 11

Fred looked at them for a while without moving. Outside, somewhere in the wet grid of streets between the Türkenstraße and the Schottenring, a tram complained around a curve — that particular metallic shriek Vienna makes when steel is asked to turn a corner it does not want to turn. He had known that sound on-and-off for thirty-one years and had lived inside it, full-time and without an airplane in the middle of the week, for barely eighteen months. Ilse used to say you could tell the season by it: dry in August, mournful in November. It was September. It sounded mournful early.

He looked again at the screen.

The numbers were still there.

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It is worth explaining, what Fred Marshall had actually been doing in that room, because everything that followed — every death, every lie, every impossible thing — began with a very ordinary man

performing a very ordinary act of curiosity, badly, on a Friday afternoon. He had been looking for patterns in randomness.

Most of the things we call random are not really random at all. A shuffled deck of cards is not random; it is merely complicated. If you knew the exact position of every card, the precise force of every riffle, the humidity in the room and the slight stickiness of a thumb, you could in principle predict the order of the whole deck. The randomness is not in the cards. It is in your ignorance. Physicists call this *classical* randomness, and they are faintly embarrassed by it, the way a locksmith is embarrassed by a door that has simply been left open.

The same is true of a die, a coin, a roulette wheel, a lottery machine full of numbered balls blown about by a fan. All of them are governed, second by second, by laws we understand perfectly. They are unpredictable only because measuring everything about them is beyond us. Hidden in each of them is a definite answer, waiting.

There is, however, a second kind of randomness, and it is one of the two or three genuinely disturbing facts about the universe.

Take a single particle of light. A photon. The smallest possible amount of light there is — not a little ball, not a little wave, but the smallest thing that can be said to arrive. Send it toward a piece of glass coated so that it reflects exactly half of the light falling on it and lets the other half through. Physicists call such a thing a beam splitter, which is an unusual name for a piece of laboratory equipment.

Now put a detector on each side. One detector on the path where the light passes through. One where it bounces off.

Send a single photon in.

It cannot split. It is the smallest unit there is; half a photon is not a thing that exists. So one detector clicks and the other does not. Left, or right. Through, or reflected. Zero, or one.

Which one?

And here the universe, as far as a century of the most obsessive and well-funded investigation has been able to determine, simply declines to say. Not we don't know yet. Not it's too complicated to calculate. As far as anyone can tell, the answer does not exist anywhere in the world before the detector clicks. There is no hidden note in the

photon's pocket. There is no tiny ledger in the glass. The outcome is made, not revealed.

This is the difference between a shuffled deck and a photon, and it is the reason that quantum mechanics, which is otherwise the most successful theory in the history of thought, has made every serious person who has studied it slightly ill for a hundred years.

Fred had a box on his desk that did this.

It was not impressive to look at. It was the size of a shoebox, matte black, with a small green light and a USB cable, and it had cost him four thousand euros of his own money in a fit of retirement spending he had not entirely justified to himself. Inside there was a weak light source, a beam splitter, two detectors, and some tidy electronics. Every microsecond it asked the universe a question with only two possible answers and wrote down what it got.

Left or right. Zero or one.

Quantum mechanics supplied the randomness.

Fred supplied the coffee.

The box had been running, on and off, for nineteen months. It had produced, in that time, several billion binary digits: a river of noise, meaningless by definition, the purest unpredictability that physics allows. Casinos buy such devices. So do banks, and armies, and anyone who needs a secret nobody can guess, because a secret built on this kind of randomness is not merely hard to guess — it is, in a precise and provable sense, not there to be guessed until it is made.

Fred had spent thirty-nine years at the European Space Agency, very nearly all of them in a long low building behind the dunes at Noordwijk, on the North Sea coast of the Netherlands, separating faint signals from loud noise: the wobble of a star against the grain of a detector, the breath of a planet's atmosphere inside the glare of its sun. He had been doing to this river of noise what he had done to every other stream of data in his professional life. He had been looking for structure in it.

Not because he expected to find any. That was the point. He was testing a statistical filter of his own construction, an elaborate and rather beautiful thing he had been building since Ilse died, and the correct behavior of a filter, when applied to genuine randomness, is to find nothing at all. Finding nothing was the test. A thermometer

that reads the correct temperature of a bucket of ice water can be trusted afterward with a fever.

For seventeen months the filter had found nothing.

Today it had found seven numbers.

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He reran the analysis. This took eleven minutes, during which Fred stood at the window with his hands in his pockets and watched the rain make the lights of the Türkenstraße run downward like wet paint. On the corner, the Syrian grocer was dragging his crates of pomegranates back under the awning. A woman went past under a transparent umbrella with a small boy attached to her other hand, the boy walking in that deliberate way small boys walk when they have discovered that stepping in a puddle is a moral choice.

Fred did not, at this point, think anything very dramatic. He thought: I have made an error. He thought it with the mild, almost affectionate irritation of a man who had spent a career making errors and catching them, and who knew that the catching was the whole job.

The analysis finished.

The same seven integers.

He changed the random seed of his own software, which meant that every arbitrary internal choice the program made — every tie broken, every starting point picked — would now be different.

Again.

He rebooted the computer entirely, in case something was sitting in memory that should not have been.

Again.

He went into the raw data with a hexadecimal editor and looked at the actual bits, the untouched output of the box, with his own eyes, the way you might go down to the cellar with a torch rather than trusting the light switch.

Again.

At sixteen minutes past six he leaned back in the chair, and the chair made the small complaining sound it had been making since

about 2004, and he finally allowed himself to look at the shape of the thing rather than its correctness.

Five integers between one and fifty.

Two integers between one and twelve.

He knew those ranges. Anyone in Europe would know those ranges. They were printed on the side of buses.

"Don't be ridiculous," he said, out loud, in English, to an empty room.

He opened a browser and typed four letters and the site loaded: a page of blue and gold, cheerfully insisting that dreams were mathematically available.

EuroMillions. Draws on Tuesdays and Fridays. Five main numbers from one to fifty. Two additional numbers — the Lucky Stars, an absurd name that nine countries had somehow agreed on — from one to twelve.

Friday draw.

Tonight.

Fred laughed. It came out of him unexpectedly, a single dry bark in the quiet flat, and it surprised him enough that he looked around as though someone else had done it.

The obvious explanation was contamination. It was always contamination. In thirty-nine years he had watched half a dozen brilliant discoveries evaporate on contact with the truth: a planet that turned out to be a maintenance cycle in a cooling pump; a mysterious periodicity that turned out to be the badge-reader on a door; the famous three months in 2011 when a colleague two doors down at ESTEC had nearly published an anomalous signal that was, in the end, an electric kettle in the room below. Data is a promiscuous substance. It picks things up.

Somewhere in his code, then, he had accidentally introduced a formatting routine, or a fragment of test data, or a constant from an example file. Somewhere he had, without noticing, taught the program to produce numbers in exactly those ranges.

He searched the entire codebase — forty-one thousand lines, twelve years of accumulated habit — for each of the seven integers individually.

Nothing meaningful.

He searched for them in combination.

Nothing.

He searched for the words *euro*, *lottery*, *lotto*, *draw*, *jackpot*, *star* in every file, comment and configuration on the machine.

Nothing.

At half past six, the rain thickened. At twenty to seven, Frau Mikulicz from the flat below could be heard having her evening argument with the television. At six fifty-five, Fred Marshall stood up, put on his coat, and did something he would later describe, in a sworn statement, in a building with no windows, as the least scientific act of his professional life.

He went out and bought a lottery ticket, because he was old-fashioned.

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The Trafik on the corner of Türkenstraße smelled of newsprint and pipe tobacco and the particular warm dust of a shop that has not changed its lighting since 1978. Herr Neubauer sold cigarettes, stamps, bus tickets, lottery slips, and a small rotating selection of the kind of confectionery that only exists in Austria. He was watching football with the sound off.

"Grüß Gott."

"Grüß Gott, Herr Marschall."

Thirty-one years in this city and they still could not quite stop themselves adding the c. Fred had given up minding it around 1998.

He filled in the slip at the little shelf by the window, using the tiny pencil that is chained to shelves like that everywhere in the world, and he was aware, as he marked the boxes, of feeling foolish in a way he had not felt in decades — the specific hot foolishness of a serious man doing a silly thing in public.

8. 17. 26. 34. 49.

4. 11.

Two euros fifty.

He did not, walking back through the rain with the slip folded in his breast pocket, believe that he was going to win. It is important to be precise about this, because a great deal of what came afterward hinged on it and because Fred himself, in the years that followed, would be asked the question perhaps four hundred times by people with recording devices.

He did not believe the numbers would win.

He bought the ticket because they were *testable*. A lottery draw has properties that a physicist can love. It is externally controlled: the balls are in Paris, in a studio, in a machine he had no access to. It is publicly observed: several million people would watch it happen, and the result would be printed in newspapers, logged by regulators, notarised. And it is, critically, entirely independent of him. Nothing Fred did in a fourth-floor flat in the Ninth District of Vienna could affect which plastic spheres a fan blew up a tube over one thousand kilometers away.

If the seven numbers in his data came from the future, the lottery would say so.

If they came from a bug, the lottery would say that instead, and he would spend a pleasant, humiliating weekend finding it.

The ticket cost less than another evening arguing with himself.

Then he waited.

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He made an omelette he did not want and ate half of it standing up. He washed the pan. He looked at the seven numbers again, on the screen, in his own handwriting on a pad, and on the printed slip, three separate representations of the same seven facts, and he noticed that he had begun checking that they agreed, which was not rational, and he made himself stop.

At half past eight on the third of September, Fred Marshall stood in his kitchen with his phone in his hand and scrolled to the letter W, and looked at *Weiss, Martin* for perhaps twenty seconds, and then put the phone face down on the counter. He had a very clear reason. If he called Martin now, and said *I think I have seven numbers from the future*, then Martin — who was the most rigorously destructive mind Fred had ever met, and who loved him — would say the correct

thing, which was *you have lost your marbles*, and Fred would agree, and they would talk about something else, and that would be that.

Whereas if he waited two hours, the universe would answer.

He would later think about that decision a great deal. Not with guilt exactly. With a kind of clinical curiosity, the way one probes a tooth. If he had made the call at half past eight, would any of it have happened?

The answer, he eventually decided, was almost certainly yes. But it took him fourteen months and a great deal of blood to be sure.

At nine o'clock he was no longer amused.

The draw was shown on a channel he had never watched, with a presenter whose enthusiasm seemed to be costing her something. The machine was a transparent drum of tumbling white spheres, lit like a jeweler's window. Fred sat in the 1991 chair with the ticket on his knee, and found that he had adopted, without deciding to, the posture of a man at a hospital bedside.

The first ball came up the tube and settled.

Eight.

Fred stopped breathing. Not metaphorically. He noticed, a second later, that he had simply stopped, and had to start again on purpose.

Seventeen.

He moved forward in the chair, then stood, then found himself two meters closer to the television without any memory of crossing the room.

Twenty-six.

"No," he said. It was not a denial. It was closer to a request.

Thirty-four.

His right hand had closed around the back of the other chair, Ilse's chair, hard enough that the fabric was ridged between his fingers.

Forty-nine.

The presenter was saying something about a rollover. A graphic wiped across the screen in gold.

Then the two smaller spheres, from the second, smaller drum.

Four.

And:

Eleven.

For perhaps fifteen seconds, Frederick Marshall stood in the middle of his own living room and did not move at all.

The television was still talking. Somewhere below, Frau Mikulicz's program had reached a crescendo. The rain had thinned to almost nothing and the window was full of the orange smear of the streetlamp on the corner.

Fred heard none of it.

He looked at the ticket.

Then at the computer, at the other end of the room, where the seven integers sat in a terminal window above a cursor that was still blinking with the patience of a thing that does not care.

Then back at the television, where the numbers had been redrawn, larger, in a neat row, as though anyone might have missed them.

Seven numbers had existed in his laboratory data before seven numbered balls had been drawn.

The odds of matching all five main numbers and both Lucky Stars in a single line are approximately one in a hundred and thirty-nine million, eight hundred and thirty-eight thousand, one hundred and sixty. Fred knew this number the way he knew the mass of the sun. It is not a probability a human being can feel. It is roughly the chance of picking, at random and on the first attempt, one particular second out of the last four and a half years. It is roughly the chance of choosing one specific human being at random and having it be a named individual in Germany and France and Britain and Italy combined.

But Fred was not, in that moment, thinking about probability.

He was thinking about causality. He was thinking about the order in which things are allowed to happen. He went back to the computer, and sat down, and his hands were not entirely steady, which annoyed him.

The file that had produced the numbers carried a timestamp from Thursday. Yesterday. He checked it, and the operating system agreed. He checked the backup, which lived on a second machine in the hall cupboard that was switched on only to receive backups and had no

browser, no mail client, and no connection to anything except his own network. It agreed.

He computed the file's checksum — a long fingerprint of digits that changes completely if even a single bit anywhere inside the file is altered — and compared it against the fingerprint his backup script had recorded, automatically, without his involvement, at 22:04 on Thursday night.

Identical.

The file had not changed. The numbers had been there before the draw.

Fred sat back, very slowly, the way a man sits back when he has understood that he is going to have to get up again and do something difficult.

On the shelf on the opposite wall, between a photograph of Ilse in Split in 1994 and a small Meissen bird that had been her grandmother's, stood a picture in a plain black frame. It had been on some wall or other of Fred's since he was nineteen years old. It had crossed the North Sea twice, the Channel three times, and had hung in six flats in four countries.

Twenty-nine people, photographed in Brussels in October 1927.

Three rows. Dark suits, high collars, watch chains. Seventeen of them would win the Nobel Prize. One of them was a woman who had already won it twice.

They looked out of the picture with the mild, slightly weary expression of people who have been standing still for a photographer for longer than they expected to.

Einstein, in the centre of the front row, hands in his lap, looking directly down the lens like a man who suspects the camera of something.

Niels Bohr in the second row to the right. And Heisenberg, absurdly young, twenty-five and about to be twenty-six. Schrödinger, in the back row, in a soft collar, the only one not dressed like a banker. Born. Pauli. Marie Curie.

They had spent a week in Brussels arguing about what reality was permitted to do.

Fred looked at Einstein.

“Don’t,” he said.

But the thought had already formed, and thoughts of that kind do not un-form.

Perhaps the numbers had not predicted the future.

Perhaps the future had, in some way he could not yet name, participated in making them.

At this point, Fred could not accept chance. He had run the program many times and came up with the same numbers over and over again.

He sat for a long time without moving while the television talked to itself, and the rain came back, and the chestnut tree in the courtyard below dripped steadily onto the bins.

And if that were true — if it were even fractionally, provisionally, arguably true — then the winning lottery ticket lying on the arm of Ilse’s chair was the least important thing that had happened in Vienna that evening.

The numbers matched.
The questions have only begun.

THE LAST LOTTERY

Operation Heisenberg

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Coming January 8, 2027

What happens when the future arrives first?

Pre-order the complete novel on Amazon
and follow Fred beyond the first seven numbers.