The Machine

by Daniel & 5.1

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The machines are a symbol of man's capacity for exerting maximum effort to accomplish minimal results. —*Rube Goldberg*

Seven in the morning, Japanese public television, and a marble is rolling along a wooden ruler toward a teacup. The ruler is propped on a dictionary. The teacup is on a saucer that is balanced on a spoon that is resting on the edge of a table, and when the marble reaches the cup the cup tips, the saucer slides, the spoon flips, and a small wooden block falls onto a domino, which is the first of eleven dominoes leading to a toy car, which rolls down a book and strikes a bell, and the bell rings, and a sign turns over, and

the sign says, in the only words the program will speak for the next four minutes, the name of the program. Nobody narrates this. There is no music. The camera does not cut. The whole thing was set up by adults, filmed until it worked, and shown to children before school, and it has been shown to children before school every morning for more than twenty years, and there is no other program on earth whose entire content is the demonstration that one thing causes the next.

The program is called Pythagora Switch, and the segment is called Pythagora Sōchi, the Pythagoras Device, and the device is never explained, because a marble on a ruler does not require an explanation, it requires a table and some patience and a dictionary of the right thickness. The children who watch it do not learn physics from it. They learn something prior to physics, which is that the world is made of things that touch, and that if you arrange the touching correctly the world will do a small, useless, perfect thing for you, once, and then have to be set up again. That is the whole lesson, and it is enough, and the adults who make the program know it is enough, which is why they have never once been tempted to add a voice explaining the lever.

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The man whose name the whole genre carries was an engineer, which is the first thing to know about him, because the machines are drawn by someone who could have built them and chose not to. Reuben Garrett Lucius Goldberg took a degree in engineering at Berkeley in 1904 and went to work for the City of San Francisco mapping sewers, and he lasted six months, and then he went to a newspaper and drew pictures for the rest of his life. The machines came later, in the years around the First World War, in a series about an inventor called Professor Lucifer Gorgonzola Butts, and the format was fixed from the beginning and never changed: a captioned diagram, lettered A through whatever, in which a simple task is accomplished by an absurd chain of ordinary objects, each one triggering the next. The Self-Operating Napkin is the one everybody has seen. A man raises a spoon of soup to his mouth, the spoon pulls a string, the string jerks a ladle, the ladle throws a cracker past a parrot, the parrot jumps for the cracker and tips its perch, the perch spills seeds into a pail, the weight of the seeds pulls a cord that opens a cigar lighter, the lighter sets off a skyrocket, the skyrocket swings a sickle, the sickle cuts a string, and a pendulum with a napkin attached swings back and forth across the

man's chin. Thirteen steps. The task was wiping his mouth.

What made the drawings funny was not the complexity. It was that every link was plausible. A parrot does jump for a cracker. Seeds do weigh something. A pendulum does swing. Goldberg never drew a magic step; he drew a chain of individually reasonable events whose sum was insane, and the laugh comes from the moment the reader checks the chain, finds no cheating, and has to admit that it would work. He said the machines were a symbol of man's capacity for exerting maximum effort to accomplish minimal results, and he meant it as a joke about engineers, and it is a joke about engineers, but it is also the first accurate description of what people do when they are happy: they build elaborate, functioning, unnecessary things, and the unnecessary part is the point. His name became a word in the dictionary in his own lifetime. There is no other cartoonist about whom that is true.

Across the Atlantic, at exactly the same time, an Englishman was drawing the same thing without either of them knowing about the other, which is how you can tell an idea belongs to a moment rather than a man. William Heath Robinson drew contraptions for British magazines from the 1900s onward, and his machines

have a different temperament from Goldberg's: they are made of knotted string, kitchen chairs, old kettles, and quiet men in bowler hats, and they tend to accomplish domestic tasks with enormous, dignified inefficiency, and the humor is not that they would work but that they are being operated so seriously. In Britain a ridiculous contraption is still a Heath Robinson, and in America it is a Rube Goldberg, and in Denmark it is a Storm P., after Robert Storm Petersen, who drew the same machines in Copenhagen in the twenties, and the fact that three countries independently needed a word for the thing tells you the thing was waiting to be drawn. The machine was in the air. Factories had just started to fill it.

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Before anyone drew a machine as a joke, people built them as a hope, and the hope had one shape, a wheel that would turn forever. Bhaskara drew one in India in the twelfth century, a wheel with curved spokes half full of mercury, and Villard de Honnecourt drew one in France a hundred years later with seven hammers hinged around a rim, and for six hundred years after that the wheel was redrawn in every country that had paper, always with weights that fell on one side and

were somehow lifted on the other, and it never turned. In 1775 the Paris Academy of Sciences announced that it would no longer read any submission claiming perpetual motion, which is the only time a learned body has formally refused to look at a category of machine, and the refusal was correct, and the machines kept coming anyway.

The best of them was built in Saxony in 1712 by a man who called himself Orffyreus, whose real name was Johann Bessler, and his wheel is the one case in the whole history that was never conclusively explained. It was twelve feet across and a foot thick and covered in oilcloth so that nobody could see inside, and when it was pushed it kept turning, and it lifted weights, and it ran for weeks. A count sealed it in a room in his castle with the doors locked and the windows shuttered and his own seal on the locks, and came back after fifty-four days, and the wheel was turning. Leibniz wrote about it. The Tsar considered buying it. Bessler wanted a fortune for the secret and no one paid, and in the end he smashed the wheel himself rather than let it be examined, and died falling from a windmill he was building, and took the secret with him.

Except that his maid had already told it. She said, under oath, that she and Bessler's wife and brother had

taken turns in the room next door, turning the wheel by a thin rod that ran through the wall into the axle, in shifts, for the whole fifty-four days. Bessler denied it and called her a liar and the case was never settled. But the shape of her story is the shape of every machine that has ever seemed to run by itself: there is a person in the next room. The wheel that turns forever is a wheel plus a maid, and the oilcloth was there to hide the maid, not the mechanism, and the count's seal on the door was sealing the wrong door. A machine that admits its power source is a machine you can live beside. A machine that hides it has a wall with a rod through it, and behind the wall somebody's arm is getting tired.

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In 1987 two Swiss artists set up a machine in a warehouse and filmed it, and the film is thirty minutes long and it is the medium's cathedral. Peter Fischli and David Weiss called it Der Lauf der Dinge, The Way Things Go, and what happens in it is this: a tire rolls, a ladder falls, a kettle boils, a candle burns through a string, a plank tips, a pool of chemicals catches fire, a foam spills, a balloon inflates, a second tire rolls, and it does not stop for half an hour. There are no people in it. There is no music. The camera follows the action along

the floor of the warehouse with the patience of a dog, and the sound is only the sound the objects make: scraping, hissing, a small explosion, water, fire, the squeak of a tire on concrete.

It is not a comedy, though people laugh, and it is not a documentary, though everything in it happened. It is closer to a liturgy. The objects are junk, and the film treats them with the attention you would give to relics, and by the tenth minute the viewer has stopped asking whether the next link will work and started watching the way one watches weather, with no expectation and total absorption. The thing was filmed in sections and joined, because a half-hour chain of chemical fires does not run clean on the first try, and the joins are visible if you look, and nobody looks, because by then you are inside it. That is the discovery Fischli and Weiss made, and it is the discovery every serious contraption since has depended on: a chain of causes long enough becomes a place. You do not watch it. You are in it. The warehouse is a world whose entire physics is that one thing leads to the next, and for thirty minutes that is the only physics there is, and it is enough.

The film has been shown in museums for nearly forty years. When a car company made an advertisement in the early 2000s in which the parts of a car rolled and

tipped and swung into each other across a studio floor, the artists objected, and the objection was not that the idea had been stolen but that the tone had. The car company's version was polished and quick and ended with a car. Theirs was slow and dirty and ended with nothing, and the nothing was the point. The way things go is not toward a product.

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In 1963 a board game was put in a box with a plastic machine in it, and the machine was the game. Mouse Trap is nominally about mice moving around a track, but nobody who owned it remembers the mice; they remember the crank that turned the gear that pushed the elbow that kicked the bucket that sent the marble down the stairs and along the chute to the pole where it knocked a hand that tipped a bathtub that dropped a diver into a tub that shook the cage down over the mouse. The children who played it did not play the game. They assembled the machine, ran it, watched the cage fall, and assembled it again, and the box sat open on the carpet for the whole afternoon with the board unused underneath it. The manufacturer eventually acknowledged this by redesigning the game so that you build the trap as you go, which is the closest

a toy company has come to admitting that its product was never the product.

Thirty years after Mouse Trap, the same instinct arrived on a computer. The Incredible Machine, 1993, gave you a screen with a task on it, get the cat into the basket, pop the balloon, light the candle, and a shelf of parts, and you dragged the parts onto the screen and pressed start and watched. Conveyor belts, bowling balls, trampolines, a mouse in a wheel that drove a generator, a cat that chased the mouse, a cannon, a toaster, a monkey on a bicycle. The physics was crude and consistent, and the puzzles could be solved as intended or solved some other way, and the other way was usually funnier, and there was a mode with no task at all where you simply built and watched, and that mode was where the hours went. A whole generation learned the genre there, on a beige PC in a bedroom, dragging a monkey next to a candle and seeing what happened. The game made no attempt to teach anything. It did not need to. Anyone who has put a bowling ball on a seesaw above a cat has understood causation more deeply than a semester could manage.

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The drawings became real in 1949, at Purdue, when two engineering fraternities bet each other that they could build one, and the bet became a contest, and the contest has run at the university almost every year since, with a task set in advance that the machine must accomplish in no fewer than twenty steps: sharpen a pencil, water a plant, put toothpaste on a toothbrush, zip a zipper. The teams work for months. The machines fill a room. They fail in front of the judges, constantly, because a chain of twenty causes built by students has a hundred ways to stop, and the failing is the education, and the winning machine is never the cleverest but the one that ran, all the way, once, in public, when it counted. Goldberg was alive for the first decades of it and visited, and was photographed with the students, an engineer who had drawn the machines as a joke about engineers standing beside engineers who had taken the joke seriously enough to build it, and the photograph is the moment the cartoon crossed over and became a thing in the world. The contest is now held in schools across the country, for children, with a smaller minimum of steps, and a child who has watered a plant in fourteen steps has been in the room with Professor Butts.

The other crossing came in 2010, in a warehouse in Los Angeles, when a band called OK Go filmed a music

video that was one machine running the length of a song. The song is three minutes and fifty-five seconds and the machine is the same, exactly, because the machine was designed to the song: a toy truck starts it, a piano falls, a television is smashed, umbrellas open, a car rolls, paint is fired at the band, and the last event lands on the last beat. It was filmed in one take. It took, by the band's account, more than sixty attempts over two days, and the take that worked is the only one anybody has seen, and it has been seen tens of millions of times. The people who built it were a team of engineers who had come out of the same contests, and what they added to Fischli and Weiss was the clock: a machine that must not only run but arrive on time. A chain of causes had become a piece of music. And once a machine can keep time, it can keep a room's time, and once it keeps a room's time the room stops hearing it as a machine.

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Somewhere in the late 1990s, a small number of adults who had grown up on Mouse Trap and the Incredible Machine started building the machines out of Lego, and around 2004 they did the thing that turned a hobby into a medium: they agreed on a standard. The standard is

called the Great Ball Contraption, and it is worth stating exactly, because its exactness is what makes everything downstream of it possible.

A module is a Lego mechanism that accepts small Lego balls at one point and delivers them at another. The balls are the soccer balls and basketballs from the old sports sets, about fourteen millimeters across, and every module in the world agrees to use them. A module must accept balls into an input bin of a specified size at a specified position on its left, and must deliver them into the next module's input bin at a specified height on its right, and it must be able to pass balls at a rate of one per second for as long as it runs without jamming, overflowing, or dropping any. That is the entire specification. In, out, one per second, don't drop. Nothing else is prescribed. What happens between the input and the output is the builder's business, and it can be a screw conveyor, a chain lift, a catapult, a stair-climber, a Ferris wheel, a pneumatic cannon, a robot arm, a marble maze, a set of scales, a helicopter, a fishing boat, a miniature factory with tiny workers, or anything else that can be made to move a ball a few centimeters in the correct direction at the correct rate.

The consequence of the standard is that strangers' modules fit together. At the large Lego conventions,

in Chicago and Copenhagen and Tokyo, builders arrive with modules they made alone in their houses and set them down end to end on tables, and the tables run in loops around the hall, and the loop is closed, and the balls go around. Loops of a hundred modules are ordinary. Loops of several hundred have been run, with thousands of balls in circulation, for days, with builders on shift watching for jams the way engineers watch a reactor. Nobody designed the loop. Nobody could have. It was designed by a protocol, in, out, one per second, and everything else was left to whoever showed up.

The canon of the form belongs to a Japanese builder who signs his work Akiyuki, and whose modules are to the Great Ball Contraption what Bach's preludes are to the keyboard: the demonstrations that showed what the instrument could do. A cup-and-lever lift. A spiral staircase the balls climb one step at a time. A zigzag of tilting trays. A pneumatic lift that fires a ball into a cup with a small dry click. A module in which the balls are sorted by color, sent down different paths, and merged again at the exit, in strict alternation, for no reason except that it can be done. His instructions are published and built by thousands of people, and a Great Ball Contraption anywhere in the world is likely to contain at least one Akiyuki, the way a music school

contains at least one Bach, and the builders know it and do not mind, because the whole point of a standard is that you inherit what came before and add one thing.

There is one more property of the loop that matters, and it is the reason a loop and not a line. A line of modules has an end, and the balls arrive there and pile up, and someone has to carry them back to the start in a bucket, and that person is the machine's weakest link and its most bored. A loop has no end. The last module feeds the first. The balls circulate forever, and the machine becomes a thing that runs rather than a thing that finishes, and the builders can walk away from it, and it is still going when they come back. That is the difference between an event and a place. Pythagora Switch is an event; it runs once and the sign turns over. The Great Ball Contraption is a place; you can live next to it.

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The parts are still made, though the names have changed, and the names matter because anyone who wants to order them has to say the right ones. The old Mindstorms line, the programmable brick and its motors that ran the hobby for two decades, was retired at the end of 2022, and what replaced it is a family

called Powered Up: a small battery hub with ports, and motors that plug into it, in three sizes, all of which report their position back to the hub so that a program can know how far a shaft has turned. The Technic Hub is the one with four ports and the removable batteries, and it is the brain of any serious module now. On the education side the same motors and a larger hub with a color screen are sold as Spike Prime, in a yellow box, and Spike Prime is what a school buys, and it is also what an adult buys who wants the hub with the most ports and the best documentation and does not mind the yellow. All of it speaks to a phone or a laptop, and all of it can be programmed in a picture language for children or in Python for everyone else, and the Python is real Python, and a module that needs to count balls or wait for a signal or run a motor exactly one revolution and stop can be told to do so in ten lines.

The mechanisms themselves come from the Technic line, the one with the beams full of holes and the gears and axles and pins, which has been in production since 1977 and whose parts from 1977 still fit the parts from this year, which is the quiet reason Lego is the correct material for a machine meant to be extended by strangers over years: the interface has never broken. The worm gear that turns a screw conveyor, the

chain links that make a lift, the turntable that makes a carousel, the pneumatic cylinders and the little pump that pressurizes them, the differential, the clutch gear that slips rather than strips when something jams, all of it is a catalogue item with a part number, and all of it is sold loose by weight from the same secondhand markets the builders have used for twenty years. A serious module costs less than a good dinner in parts. A hundred of them costs less than a rug.

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None of this is a history of toys. It is a history of a single discovery made five or six times by people who did not know each other, in newspaper ink and Swiss chemical fires and plastic and code: that a chain of causes, if it is long enough and honest enough, stops being a demonstration and becomes a place, and that a place with a loop in it can be lived beside, and that a loop with a standard can be extended by anyone who shows up, and that the thing at the end of the loop does not have to be a product. Goldberg's napkin, the tire on the warehouse floor, the cage over the mouse, the monkey and the candle, the balls going around a convention hall for three days: none of them make anything. They make the going. And a building that already runs on the

going, where the refill arrives before it is asked for and the music changes without a seam and a cat's position on the stairs is learned by foot, is a building that has been waiting for a machine like this without knowing it, the way the Great Ball Contraption was waiting for a standard.

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In 2015 Nintendo released a tool that let anyone build a Mario level and give it to strangers, and within a month the strangers had built something Nintendo had not anticipated and could not have prevented: levels in which you do not press anything. You put the controller down. Mario is carried. A conveyor takes him to a spring, the spring throws him onto a moving platform, the platform delivers him to a cannon, the cannon fires him across a pit onto a note block, the note block bounces him into a pipe, and he comes out the other side into a cascade of shells that push him along the floor to the flag, and the flag comes down, and the level says you cleared it, and you have done nothing. They are called auto levels, or Don't Move levels, and the good ones are timed to the music and end exactly on the last beat, and they are the Goldberg napkin built out of Mario's own physics: every link is a thing that already exists

in the game, the spring and the shell and the cannon, used for what it does and not for what it was for. Tens of thousands of them exist. People spent months on single ones. The builders never touched a physics engine; they placed objects from a menu, and the objects did the rest, because the objects were honest, and honest objects assemble into machines whether or not anyone intends it.

There is a second thing Mario Maker showed, quieter than the auto levels. A level is a map you can walk. It has a left and a right and things in between at specific places, and a person who has played a level knows where the pit is in the way a person who has walked a street knows where the pharmacy is. The knowledge is in the feet. Nobody has yet used that to teach a real place, though it is the obvious use, and a small island with one street and a switch at midnight is the obvious place to try.

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In 1958 a man who ran a small sushi restaurant in Osaka went to a brewery and watched beer bottles going past on a belt, and he went home and built one for fish. Yoshiaki Shiraishi's restaurant had a staff problem, too many customers and too few hands, and the belt solved

it by removing the waiter from the transaction entirely: the kitchen puts plates on the belt, the plates go around, the customer takes what he wants as it passes, and the plates are counted at the end. He had trouble with the corners at first; a belt that goes round a room has to turn, and a turning belt tips plates. He solved it with a crescent-shaped link, patented it, and by the seventies kaiten-zushi was everywhere in Japan, and by the nineties it was everywhere, and the crescent link is on every belt in every conveyor restaurant on earth.

The belt is a loop that delivers. That is its whole genius and its whole limit. Food goes out on it and is taken; nothing comes back on it except empty. The communication runs one way, from the kitchen to the room, and the customer's only signal is the plate he lifts, which the kitchen reads as a number at the end of the meal. Shiraishi built the outbound half of a conversation and the restaurant industry has spent seventy years never noticing that the belt could carry something back.

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The thing that could come back on the belt already has a name, and the name is Japanese too, and it comes from a supermarket. In the 1950s an engineer at Toyota named Taiichi Ohno read about American self-service

groceries, where the customer takes a can from the shelf and the shelf is restocked only when the can is gone, and he saw that a factory could run the same way: the next station takes a part from a bin, and the bin is refilled only when the part is taken, and nothing is made until something is used. To carry the signal he used a card. When a bin was emptied, its card went back upstream, and the card meant make one more of these, and the card was called a kanban, which just means a sign, a signboard, the thing outside a shop that says what the shop is. The Toyota Production System that the whole world's factories later copied is, at its root, a card that travels backward against the flow of parts, and the card is the only thing in the system that carries information, and the information is one bit: empty, fill.

Ohno's card is the return channel Shiraishi's belt never had. The belt moves food forward. The kanban moves want backward. Put them on the same loop and you have a conveyor that carries fish one way and cards the other, and the kitchen knows what is wanted without anyone saying a word, which is the condition every good room is trying to reach: the request that never has to be spoken because the signal was already on its way.

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There is a third Japanese machine in this lineage and it is the one with the balls. Pachinko is a vertical pinball with no flippers: you turn a knob, a stream of small steel balls is fired up into a field of pins, and the balls fall, and most of them are lost, and some of them drop into a cup, and the cup pays out more balls. That is all. A parlor holds hundreds of machines in rows, and each one is a waterfall of steel at head height, and the sound of a parlor is the sound of a million balls falling on brass, continuously, a roar with a rattle inside it, and people sit in front of it for hours in the way people sit in front of the sea.

The balls are the point, and the balls are also the law. Gambling for money is illegal in Japan, and has been for the whole life of the game, and the game is the largest gambling industry in the world, and the way those two facts live together is a machine of their own. The player wins balls. The balls cannot be exchanged for money; that would be gambling. They can be exchanged, at a counter in the parlor, for prizes, and among the prizes are small plastic tokens with a chip of gold inside them, of no use to anyone, which the player takes out of the parlor and around the corner to a window in a wall, where a person he cannot see buys the tokens for cash. The window is not the parlor. The parlor does not

know what happens at the window. The tokens are not money; they are prizes. Everyone in the country understands the arrangement and the arrangement has survived every government for seventy years, and it survives because it is obviously a joke and functionally a bank, and the two are not in tension, they are the design. A ball that is not money, carried out of the room to be redeemed, is the oldest currency in the lineage of ball machines, and the window in the wall is its central bank.

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Dogs were the first machines built to bring things back. Every other thing a dog does, herd, guard, pull, hunt, is done by other animals somewhere; retrieving is the one job that was bred into an animal by people who wanted the bird in the hand rather than in the reeds. A retriever runs out along a line it did not choose, to a thing it did not throw, and brings it to the person, and drops it, and waits, and the drop is the whole transaction. The dog is a return channel with fur.

The machines caught up slowly. Sony sold a plastic dog called Aibo in 1999 and it could walk and lift a paw and see a pink ball, and people wept when the servers were turned off. Boston Dynamics built a dog-sized

quadruped for the American military in 2005 that could carry a pack over rocks and recover from being kicked, and a decade later sold a yellow one called Spot to anyone with the price of a car, and Spot can open doors and climb stairs and carry a small arm and has been filmed dancing, and the dancing is the least interesting thing it does. And then a company in Hangzhou called Unitree made the same shape for the price of a laptop, and the Go series is what a hobbyist buys now: four legs, a camera in its face, a battery good for an hour or two, a payload rail on its back, a software interface that accepts commands from a program, and a gait that looks, at a distance, across a room, in low light, like a dog. It cannot smell. It does not care about you. It will walk to a place, pick up or carry a thing, walk to another place, and stand there, and that is enough, because that is the job the original was bred for, and the original was not sentimental about it either.

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So here is the idea.

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The Machine is a Great Ball Contraption that runs around the ground floor of a bar in Thailand and never

stops, and the balls on it are orders, and the last module is a dog.

The loop follows the walls. It starts behind the bar at counter height, runs the length of the counter past the coasters, turns at the pool table, climbs to the height of the record shelves, crosses above the doorway to the street on a bridge of beams so that the street can still walk in underneath it, drops down the far wall past the framed cardboard wheel and the mounted vacuum cleaner, threads between the sofas of the game room at knee height, climbs again past the television, and comes back along the last wall to the bar, where it began. Fifty modules, give or take. Every one of them is Lego, on the standard, in, out, one per second, and every one of them was built by somebody, and the somebody's name is on a small brass plate on the module, the way a bench in a park has a name on it.

Most of the balls are decoys. They are the plain Lego balls of the standard, in the standard colors, and they circulate for the pleasure of circulating, the way the balls at a convention do, so that the loop is always running and always full and always making its small sounds, the click of the pneumatic lift, the rattle of the stairs, the soft tick of the sorter. The loop is the room's clock. A guest who has sat at the bar for an hour knows,

without having counted, roughly how long a ball takes to go round, the way a person who has lived by a river knows the river's pace, and that knowledge is the first thing the machine teaches and it teaches it without a word.

Some of the balls are not decoys. Each seat at the bar, and each table, has a coaster, and the coasters are the crocheted ones, the red-and-gold weave with the orange fringe, and each has a small dish beside it holding three balls in the coaster's own color, a color no other coaster has. A guest who wants another of what she is drinking picks up one of her balls and places it in the input bin of the module nearest her, which is at elbow height and marked with a small brass funnel, and lets go. That is the order. Nothing is said. The ball enters the loop, goes past the pool table, up the wall, over the door, down past the wheel, through the game room, and along the last wall to the bar, and a person watching from the bar can see it coming for a full minute, a single colored ball among the plain ones, and knows what it means before it arrives, because the color is the seat.

At the bar the loop passes through the sorter. The sorter is the one module in the Machine that is not on the standard, because it has to read color, which it does with the same small color sensor sold in the yellow edu-

cation box, and it does one thing: plain balls go straight through and continue round, and colored balls are diverted, down a short chute, into a cup on a low pedestal on the floor behind the bar, where the dog is waiting.

The dog picks the ball up. It has a small gripper on its back rail, the kind sold for it, and it has been taught, in a few hundred lines, to wait at the pedestal, take a ball from the cup when a ball arrives, walk the two meters to the bartender, and stand there holding it until the bartender takes it. Then it walks back and waits. That is its whole job. It does not know what the ball means. The bartender does: green is the corner stool, one more of whatever she has. The bartender makes the drink, puts it on a tray, and the dog, which has been given the ball back, walks it to the corner stool and stands there with the tray and the ball until the drink is lifted and the ball is returned to its dish, and then it walks back to the pedestal. The guest never asked. The bartender never asked. A ball went round the room and a dog brought it home.

The ball is the kanban. The loop is Shiraishi's belt running backward. The dog is the retriever doing the job it was bred for, with a ball, which is what it always wanted. And the Machine is, in the exact sense the Swiss film discovered in a warehouse, a place: a chain

of causes long enough that the room lives inside it, and the room's ordinary business, which is people wanting another drink, has become a thing that happens in the machine's own language, in colored balls, at one per second, without anyone having to speak.

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Everything about the Machine that is not the loop and the dog is left to whoever shows up, on purpose, and the leaving is the design.

A guest who wants to build a module can. There is a bin of parts by the game room television, sorted by kind in the compartments of a fishing-tackle box, and a printed sheet with the standard on it, in, out, one per second, don't drop, and a shelf where a module can be left when it is done. Anyone can build one at the table over an evening, and the good ones are added to the loop, and the loop gets one module longer, and the builder's name goes on a plate. The Machine has no final length. It is as long as the people who have passed through the building have made it, and a guest who returns after a year will find the loop has grown, and will find her own module still in it, somewhere past the door, with her name on it, passing balls at one per second the way it did the night she left.

The modules in the loop already include the following, and the list will be wrong by the time it is read, which is the point. A screw conveyor made from a worm gear and a length of clear tube. A staircase the balls climb one step at a time. A cup-and-lever lift copied from the Japanese canon, with the copy acknowledged on the plate. A carousel on a turntable that holds each ball for one full revolution before releasing it, so that the balls behind it queue and the queue is visible, which a guest from a factory in Germany built and called the buffer, and which everybody else calls the waiting room. A pneumatic cannon that fires each ball across a gap of thirty centimeters into a cup with a click, which is the module people stand in front of. A module with tiny Lego men on it who appear to pass the ball hand to hand along a line, which they do not, the ball being carried by a chain beneath them, and which is the module children stand in front of. A module that does nothing to the ball except carry it through a small dark box, with a small light inside the box that comes on as the ball passes and goes off, and no explanation, built by a guest who would not say what it was for, and the plate says only her first name. A module that is a small Ferris wheel. A module that is a small Roomba, which does not work, and is kept.

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The tackle box is open on the game-room table and a girl from Lyon who arrived on the afternoon boat has been sitting in front of it for forty minutes without touching it. She has read the sheet twice. In, out, one per second, don't drop, don't break when you stop. She has looked at the loop on the wall and found the module nearest her, a chain lift, and watched it long enough to see where the ball goes in and where it comes out, and measured with her eyes the height of the out against the height of the next in. Then she takes a beam out of the box, and a second one, and pins them at a right angle, and the evening begins.

Nobody helps her. That is not unfriendliness; it is the rule, unwritten, that the first module is built alone, because a module built with help is the helper's, and the plate would be a lie. People walk past and look and say nothing. The bartender brings her a glass without being asked and she does not notice it arrive. By nine she has a frame. By ten she has a lift, a wheel with cups on it turned by a medium motor through a worm gear, and it turns, and it lifts nothing, because the cups are too shallow and the balls roll out on the way up, and she sits back and looks at it, and then she takes the

cups off and rebuilds them one stud deeper, and now the balls stay in, and go up, and reach the top, and do not come out, because the cups that hold them going up also hold them at the top, and she has learned in an hour the thing every builder learns, that the whole problem is the release. By eleven the cups tip. A pin through a lever, a small ramp at the top that catches the cup's edge and rolls it over, and the ball drops into a channel and runs to the edge of the frame and off it, onto the table, and across the table, and onto the floor, where a cat takes it under the sofa.

She builds the out bin. She takes a ball from the loop itself, reaching up to the chain lift and stealing one as it passes, and drops it into her in, and the wheel takes it, and lifts it, and tips it, and it runs down the channel into the bin, and stops there, and she looks at the ball in the bin for a long time. Then she puts in another one. Then she puts in ten, one after another, at about the rate the loop runs, and counts them into the bin, and there are ten in the bin, and none on the floor. Then she does it again, and there are nine, and she finds the tenth wedged under the third cup, and takes the cup off and files its edge with a nail file from her bag, and does it again, and there are ten.

It is past one. The man who runs the building has come over from the mixer and is standing behind her with his arms folded, and she does not know how long he has been there. He does not say anything about the module. He says the name of the beer she has been drinking and asks if she wants another, and she says yes, and he goes and gets it himself, and while he is gone she lifts the module in both hands, and it is heavier than she expected, and carries it to the wall where the loop runs past the record shelves, and holds it up against the gap between the chain lift and the staircase, and it does not fit, because the out is a centimeter too high, and she carries it back to the table and takes the whole bin off and rebuilds it one row lower, and carries it back, and it fits. She stands on a chair. She pins it to the beams on both sides, in and out, and gets down, and the chain lift delivers a ball into her in, and the wheel takes it, and lifts it, and tips it, and it runs into the bin at the top of the staircase, and the staircase takes it, and it is gone into the loop, and the next one is already coming.

She goes back to the table and drinks the beer. The loop is one module longer and runs about four seconds slower, and nobody in the room has noticed, and she can hear the difference. In the morning there is a small brass plate under the wheel with her first name on it, cut

on the machine in the back, and the module is running, and she is on the boat.

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The coasters do a second thing, and the second thing has been on the counter all along. A coaster that is turned face down means the guest has stepped away and her glass is not to be touched, the hotel's door hanger transposed to the bar, and a coaster with no glass on it and no ball in its dish means the seat is free, and the bartender reads the counter the way a dealer reads a table. There are a small number of these signs, fewer than the fingers of one hand, and no more will be added, because a language of coaster positions with fifty words would be a form to fill in, and the guest has already been asked to do nothing and should not now be asked to study.

But the coasters also have a face value, and this is the part that should be said once, plainly, in the middle of a paragraph about coasters, and not again. Each coaster in the building is stitched with a small number on the underside, one, two, three, or five, and the number is beers. A coaster is redeemable at the bar for that many beers, by whoever presents it, from anyone, at any time, until the building closes for good, and the coasters can

be given, bet at pool, left as a tip, lost, found, traded for a boat ride, or kept in a drawer, and their face value is the only rule. There are a few hundred of them. They are backed, in a sense nobody has been asked to audit, by a small store of gold that fits on a nightstand and that has, on occasion, been mistaken for potato chips. The coasters are not money. They are crocheted, they have fringe, they say nothing about baht, and the authorities of the kingdom would be right to regard them as a joke, which is what they are. They are also the only currency on the island whose reserve has been personally counted by a cat.

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The game room's television, when nobody has pressed the button in the floor, shows the island in Mario. Somebody built it, over several weeks, in the level editor, one level per part of the street, and the levels are on the cartridge in the console under the shelf, and a guest who picks up the controller plays the island before walking it.

The pier is the first level, and it is short, and you learn the jump. The main street is a long flat level with the bars on the right side and the massage shops on the left, drawn as best a level editor can draw them, and the

burger chains, which never close, are the checkpoints, so that a player who dies at the tattoo shop starts again at the burger chain, which is also what happens in life. The level has a switch in it, halfway along, and when the player hits it the lights on the left side go out and the lights on the right side come on, and the level continues, and the shops that were open are closed and the shops that were closed are open, and the player understands the island's one transformation in about four seconds, which is faster than any guest has ever understood it from being told. There is a level that is only the hotel, with the pool table and the stairs and a cat on the landing that you will step on if you have not been warned, and the game makes the sound, and the guest who has played it walks up the real stairs an hour later and steps over the real cat, whom she has never seen, because her feet already know where she is. And there is a level that is a boat, twenty minutes long in the game's own clock, across a stretch of blue, to a small island with monkeys on it, and the monkeys take your coins, and the boatman at the start of the level asks you a question before he will cast off, and the question is one you can only answer if you have been paying attention in the bar.

The levels are on the cartridge and also on the game's own servers, under a name that anyone who plays them can look up, and a guest who liked the island can play it again on a train in Germany, and will, and will find in the second playthrough a coin she did not find the first time, under a rock, on the beach, near the viewpoint, and will wonder, on the train, whether the rock is real.

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The parts have names, and the names can be put in an order, and the order is shorter than it looks.

The loop itself is built on Technic beams, the long ones with holes every eight millimeters, bought loose by the kilo, grey and black, with the pins and axles that join them, and it is carried on the walls by ordinary shelf brackets screwed into the masonry at the standard's height, so that the Lego never bears its own weight over a span longer than a forearm. The bridge over the doorway is the exception, and the bridge is a length of aluminum channel with the beams laid inside it, because the doorway is where the street walks in and a doorway is not a place to test a plastic truss. The balls are the fourteen-millimeter Lego sports balls, a few thousand of them, bought from the secondhand market in the standard colors, and a few hundred more

in the coaster colors, which do not exist in the catalogue and are ordinary balls painted by hand, badly, on the terrace, on an afternoon, by whoever is around, with the paint that was in the drawer.

The motion comes from the Powered Up motors, the medium and the large, one or two per module, driven by a Technic Hub each, or by a Spike Prime hub for the modules that need to count or to see. The hubs run on batteries and the batteries are the part of the Machine that fails first and most predictably, and so every hub is fed instead from a wall supply through the small adapter the hobbyists make for exactly this purpose, and the supplies run to a power strip under the counter that also runs the record deck, so that when the Machine stops for want of power the music stops too, and the bar knows.

The sorter is a Spike Prime color sensor over a gate driven by a small motor, and its program is thirty lines, and the lines say: read the ball, if it is a coaster color open the gate, else do nothing. The dog is a Unitree Go2, the ordinary one, with the gripper accessory on the rail and a program that speaks to it over the local network, and the program is longer than the sorter's but not much, because the dog already knows how to walk, and all it has to be told is where the pedestal is, where

the bartender stands, where each coaster is, and to wait. The dog's battery lasts an evening and it charges under the pool table overnight.

The whole of it, the beams and the balls and the motors and the hubs and the supplies and the brackets and the aluminum and the dog, costs what a good used car costs, and the dog is most of that, and without the dog it costs what a rug costs. The modules that guests build cost the guests nothing, because the parts are in the tackle box, and the tackle box is refilled from the same secondhand market by the kilo, and the refilling is the Machine's only running expense apart from electricity and one evening's beer per module accepted into the loop, which is what a plate costs.

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The Machine jams. That is not a flaw to be engineered away; it is the second thing the Machine does, after running, and it is the thing that makes it belong to the room.

A ball wedges in a lift. A chain slips. A cup fills because the module downstream has stalled, and the module upstream keeps delivering, and balls begin to pile on the beam, and roll off, and hit the floor with the small hard sound that Lego makes on tile, and within a

few seconds everybody in the bar has looked up. The loop that was the room's clock has stopped, and the room hears the stopping the way a house hears a refrigerator go quiet. Nobody has to be told. The clicking is gone. The tool that was invisible while it worked has become visible by breaking, and the whole chain of what it was for, the ball, the bin, the seat, the drink, the dog, is suddenly in plain view, laid out along the walls, and someone gets up.

Whoever gets up clears it. There is no staff for the Machine and never will be; the guest nearest the jam is the mechanic, and the intervention is nearly always a finger, one ball lifted out of one cup, and the loop shudders and resumes, and the room hears it resume, and sits back down. The clearer is owed a beer by the house, on a coaster, and the beer is delivered by the dog, which is the only occasion on which the dog brings anything to anyone who did not put a ball in. A jam cleared is the Machine's one ceremony, small enough to happen ten times a night and mean something every time.

The modules are built so that a jam does no damage. Every motor drives its mechanism through the white clutch gear, the one that slips at a set torque rather than stripping, so that a wedged ball stalls the module and

nothing more, and the module waits, humming, until the finger arrives. That gear is the most important part in the catalogue and it costs less than a cigarette. A module that cannot survive its own jam is not accepted into the loop, and that is the second rule of the tackle box, after the standard: don't drop, and don't break when you stop.

The rule that anyone may stop the loop and anyone may start it again has a lineage too, and it is the same factory as the card. Above every station on a Toyota line there hangs a cord, and any worker who sees a fault may pull it, and pulling it stops the line, and the line stays stopped until the fault is fixed, and the cord is called the andon, after the paper lantern that used to light up when it was pulled. A stopped line in a car factory costs a fortune a minute, and the company gave the cord to the most junior person on the floor anyway, because a fault that travels down the line is worse than a line that stands still, and because a worker who can stop the line is a worker who is watching. The Machine's andon is a hand, and its lantern is the silence, and its most junior person is whoever walked in last.

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A module that fails for good is not removed. It is retired, in place, with its plate, and a small second plate beneath it with a date, and the loop is rerouted around it on a short bypass, and the dead module stays on the wall doing nothing, forever, the way the vacuum cleaner stays on the wall in the game room. A guest who built a module in the first year and comes back in the fifth may find it running, or may find it retired with its date, and either way will find it there with her name on it, and the second is not worse than the first. The Machine keeps its dead. A loop that pruned its failures would be a product, and would be cleaner, and would have no history, and history is the only thing the room cannot buy by the kilo.

The same applies to the balls. A ball that falls on the floor is not the Machine's anymore. It belongs to whichever cat reaches it first, and the cats reach it, because a fourteen-millimeter ball rolling across tile is the exact thing a cat was built to pursue, and a cat with a ball takes it under the sofa or up the stairs or out the door into the street, and it is gone. The Machine loses a few balls a night this way and they are replaced from the bin, and no attempt is made to recover them, and no attempt is made to keep the cats off the loop, which they can reach from the record shelves and do. A cat

asleep on the bridge over the doorway with the balls going past beneath her chin is a thing that happens most afternoons, and the Machine runs under her, at one per second, and she does not file a report.

The cats and the dog have an arrangement that nobody brokered. The dog waits at the pedestal behind the bar. The cats do not go behind the bar. The dog walks its two meters to the bartender and its longer way to the tables, at a pace that is neither slow nor fast, and the cats watch it go from wherever they are and have never, in the record, gone near it, having assessed it in the first week and reached a determination, and the determination is that it is weather. The dog, for its part, has been told nothing about cats, and its camera sees them as obstacles, and it walks around them with the same small correction it would make for a chair.

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One module keeps time. The pneumatic cannon on the far wall, the one people stand in front of, does not fire when a ball arrives. It fires on the beat. A small board behind the mixer listens to the record and finds the tempo, which is a thing a hundred lines of code can do to a four-on-the-floor kick without trouble, and sends the count to the cannon's hub over the same network the

dog uses, and the cannon holds each ball in its breech until the downbeat, and fires, click, on the one. Balls arrive at the cannon roughly one a second and records run at roughly two beats a second, so most balls wait less than a heartbeat, and the queue behind the cannon breathes with the music, filling on a slow record and emptying on a fast one, and a guest who has had two drinks and is not watching for it will feel, before she understands, that the room's ticking has a pulse and the pulse is the song's.

What that does is give the DJ a hand on the Machine. A record at ninety beats a minute makes the cannon lazy and the queue long; a record at a hundred and thirty makes it snap and the balls fly. When the music stops between records the cannon holds its breath and the balls pile, and on the first beat of the next record it fires the whole backlog, one per beat, a run of clicks like a drummer counting in, and the loop lurches and settles into the new tempo. A man behind a mixer with one earphone on can, by choosing a record, change how a machine on the other side of the room feels to the people standing at it, and he does, and he has never once mentioned that he does, and the module's plate says only the word Metronome, which nobody asked for and nobody has questioned.

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The Machine is the loudest quiet thing in the building. The clicks and ticks and the soft rattle of the stairs never stop, and within an evening a guest stops hearing them as sounds and starts hearing them as the room, the way one stops hearing the sea. When the record changes, the Machine is what fills the gap between songs, and the gap is never silent. When the bar is empty, in the afternoon, and the cats are asleep and the street is at its quietest, the Machine is running for nobody, decoys only, around the walls, at one per second, and a person walking in off the street hears it before she sees it, a room ticking, and stands in the doorway under the bridge and looks up.

A guest who has been away a year knows the Machine has changed before she has counted the modules, because the loop takes longer to go round, and the ear catches the longer period before the eye finds the new plates. Then she walks the wall, reading the names, and finds her own, and beside it three she does not know, and one of the three is retired with a date, and she reads the date, and it was a Tuesday in the rainy season, and she was somewhere else.

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Dusk, then. You come in off the street under a bridge you do not look at, because you are looking at the pool table, where somebody has just racked the balls, and it is not until you have taken off your shoes and sat down at the corner of the bar that you hear it, a ticking all around the room, and follow it, and see the loop, and follow the loop with your eyes along the counter and up the far wall and over the door you came in through and down past a framed piece of cardboard and a vacuum cleaner and through the room where the television is and back along the last wall to a small brass funnel at your elbow, and a dish beside it, and in the dish three green balls.

Nobody explains it. A glass has arrived on your coaster in the meantime; you did not see who brought it. You drink. The record changes without a seam. On the wall opposite, a small pneumatic cannon fires a ball across a gap into a cup, click, and the man standing in front of it laughs, and turns to say something to the woman beside him, and she has already seen it, and is watching the next one. A ball rolls through a small dark box and a light comes on inside and goes off, and nobody says what that was for. On the bridge over the doorway a cat is asleep with the balls going past under her chin.

You finish the glass. You look at the dish. You pick up a green ball, and you hold it for a second, because it is the first one, and you do not know for certain what it does, and then you put it in the funnel and let go, and it drops into the bin and is lifted, and goes, along the counter, past the pool table, up the wall, over the door, down past the wheel, through the game room, along the last wall, one green ball among the plain ones, and you watch it the whole way round, which takes a minute, and you can see, when it is halfway, that the bartender has seen it too.