After the first million Famicom systems had been sold, there was still no sign of a slowdown. Once several million families had a Famicom and desperately wanted games, Nintendo could sell all it could produce. Yamauchi saw how Nintendo's emphasis would conceivably switch from hardware, with its limited market, to software, whose market was without limits.

Desperate retailers called Nintendo, frantically demanding product. New games were anticipated with a fervor that shocked store owners, distributors, and parents. Kids camped out in front of department stores and toy shops to snap up copies before the games sold out. Nintendomania was beginning, and Yamauchi, raking in more money than he had ever seen before, couldn't feed the frenzy quickly enough.

The success of the Famicom was unprecedented. Eventually, the fourteen competing home video-game machine companies withdrew from the market. The MSX was put in its place as a personal computer, not a game machine. Sega, a small arcade-game company, released a competitor called the SG-1000 the same year Nintendo released the Famicom, but it fizzled. And in spite of updated systems released by Atari, Nintendo had no competition to speak of. What had begun as the Yamauchi family business was inconspicuously on its way to becoming one of the most successful enterprises in the history of Japan—or, indeed, the world.

3

I. MARIO

"What if you walk along and everything that you see is more than what you see—the person in the T-shirt and slacks is a warrior, the space that appears empty is a secret door to an alternate world? What if, on a crowded street, you look up and see something appear that should not, given what we know, be there? You either shake your head and dismiss it or you accept that there is much more to the world than we think. Perhaps it really is a doorway to another place. If you choose to go inside you might find many unexpected things."

—Sigeru Miyamoto

Yamauchi's Famicoms were selling as fast as Nintendo built them. The success brought with it an unexpected, although not unwelcome, problem. A video-game system, like any other computer, could be elegant and powerful, yet it was only as useful as the software it showcased. The Famicom could have been as powerful as a mainframe computer, but no one would have noticed if the games were ordinary. Now the problem was that there were not enough good games.

Yamauchi had wisely anticipated the importance of software and prepared for it. One of the instructions he had issued to Uemura was that the Famicom must "be appreciated by software engineers." It had to be easy to program and able to do the kinds of things that game designers dreamed of doing. Any company, given the time, could copy the Famicom hardware. The key to staying ahead was software. By the time a competitor came out with a

game that was as good as a successful Nintendo game, Nintendo had to be releasing a game that left the others in the dust.

Nintendo would, Yamauchi decided, become a haven for video-game artists, for it was artists, not technicians, who made great games. "An ordinary man," Yamauchi said, "cannot develop good games no matter how hard he tries. A handful of people in this world can develop games that everybody wants. Those are the people we want at Nintendo." He was interested only in the one genius, as he put it, who would drive Nintendo. He wanted to turn Nintendo into the single place the hottest game designers wanted to be associated with. Since, in Japan, most employees stayed with one company for their entire career, it was generally impossible to seduce good designers from other companies. That meant that they would have to come to Nintendo on their own, fresh from college.

Yamauchi wanted to create a place where his geniuses would be encouraged and inspired. But how? He was used to badgering and cajoling, or simply demanding—and that was certainly not the same thing as inspiring people, nurturing them. His reputation for aloofness and cockiness had grown with Nintendo. He luxuriated in his position as the merciless Goliath of his industry. He was already infamous for squashing people—or companies—that crossed him. He made up his own rules as he went along and he refused to play politics (which enraged government officials, who were used to being catered to). But could he *inspire*? "Research and development is the most difficult department to control," he observed. "It is difficult to control artists because they do not want to compromise."

The chairman had no engineering background, but he discovered how to stimulate innovative design. Isolated from the rest of Japan's industrial hubs in Osaka and Nagoya, and from the financial capital of Tokyo, Yamauchi ignored the textbook corporate examples. He had hand-picked his three chief engineers—Yokoi, Uemura, and Takeda—a long time ago, and they had done good work for him. In order to push them (and to learn more about how the engineers and designers worked), in 1984 Yamauchi made himself the supervisor of all R&D at Nintendo, "the heart of this

company." He supported them with significantly more staff and resources.

Yamauchi arrayed his chiefs directly below him, each of them in charge of his own group: R&D 1, 2, and 3. Within an R&D group were many teams, which were pitted against each other. The teams in the groups working mostly on hardware tried to outdo the others in the virtual miracles they came up with, and the software teams competed to make the greatest games that had ever been seen.

Yamauchi has never played a video game in his life and he had little interest in them. Still, he alone was the judge and jury when it came to deciding which games Nintendo would release. It was audacious, and he was either remarkably intuitive or terrifically lucky. Yamauchi was criticized for being ruthless when it came to many of his business practices—manipulating the market, *terrorizing* employees—but no one questioned his genius when it came to choosing Famicom games. A Nintendo manager criticized Yamauchi for his obstinacy but praised his instinct: "It's like a sense for the fashion business, knowing what will become hot and popular next season. He can read a few years in advance. He is so certain that he is right that he listens to no one."

His R&D groups competed among themselves for Yamauchi's attention and praise, but there was no doubt about their collective place in the company. They were his stars. While most companies directed input from market research and from their sales force to their R&D sections, Yamauchi in those days insisted that R&D was sacrosanct: no one told his creative people what to create. The marketing department saw games only when they were completed. "He believes the marketing people will only look at what's popular right now," Hiroshi Imanishi says. "And if we make the game based on what's popular right now, the game will not be new and fresh."

The personal attention their leader lavished on his inventors was a mixed blessing. A nod from Yamauchi could make a designer's day—or week, or month. Engineers were ecstatic when they came up with a game that delighted him. On the other hand, an admonishment could be devastating. "Months of work can be disposed of

with a scowl," says an engineer who left Nintendo. The project is dead, instantly. His victims suggested that Yamauchi's judgments were capricious or the product of his moods, and that his callousness caused a great deal of frustration and anger. Engineers occasionally left, and others, exhausted and disappointed, were sent on sabbatical. They were told, "The company is making money; don't worry. Spend the time, relax. Come back fresh." Most commonly, designers whose work was rejected would only redouble their efforts, determined to have *their* game chosen the next time. Yamauchi's autocratic, often brutal system worked.

The R&D groups worked in spacious, private laboratories in the development wing of the main Nintendo building. In these white-walled, white-ceilinged rooms, rows of computer monitors were set up on tables. Their screens shone with blow-ups of circuit boards that looked like magnified city maps. Other screens, stacked as if in a television showroom, displayed details of game characters—the left cartoon hand of a boxer, for example. Still other screens were filled with column after column of fluorescent, sallow-yellow numerals.

Here and there were drafting tables, covered with schematic blueprints for games or scribbled calculations. Laser printers, networked to dozens of terminals, spewed book-length programs, and Xerox machines churned out copies of sectional drawings of game worlds.

In the design rooms, the men (no women) worked methodically as they competed to make products that would become *the* product. The goal was excellence—anything less would wind up on the scrap heap. Yamauchi believed that it was far better to put all his resources into the production of one or two hit games a year rather than several minor successes. When he released new games, he only had to manufacture, package, market, and advertise those few, but that meant that the stakes for each Nintendo game were extremely high. The games had to warrant all the costs of development (up to $1 million per game) and marketing (up to several million more).

The high stakes meant there wasn't always *wa* (harmony) within the company. Yet in spite of the competitiveness, the three chief designers respected each other and, when they were called on to do so, worked together well. Part of the reason the competition didn't turn them against one another was that Yamauchi parceled out his praise. On the other hand, if any one team had too much success, it could be expected to be slapped down. The result was that each team came to excel in different areas and at different moments. In the end it was difficult if not impossible to determine which of the three design teams contributed more to Nintendo's growth.

Takeda says Yokoi, his mentor, was "the sharpest designer." Besides all the work they had done for Yamauchi in the past, Yokoi's R&D 1 designed Game Boy, which would become another extraordinary Nintendo success. His team of thirty engineers were "a band of samurai," says a colleague outside of Japan. They operated quietly, with less recognition than the others. Their leader was *nazonoyona,* an enigma.

Yokoi was the oldest of the top engineers (though still only in his forties) and the most like traditional, old-school engineers at other companies throughout Japan. He wore simple short-sleeved shirts, and his hair was cut so that there was a neat, clean line around his ears and neck. He was dedicated to the company over everything else; he was a Nintendo man.

The games from R&D 1 would be some of Nintendo's best. One was the phenomenal game "Metroid." In the video-game world of macho stereotypes, the game's hero was a surprise. Samus, the warrior, on the quest to destroy the Mother Brain, went to battle with a nifty array of weapons and slick moves, dressed in a space suit and helmet. At the end of the game, after the Mother Brain died a screaming, light-spewing death, Samus could finally relax and take off her helmet. Long blond hair fell out. Samus, the great warrior, was a woman.

The greatest contribution of Uemura's team, R&D 2, was the Nintendo hardware itself. R&D 2 also came up with peripherals, including the Communications Adapter for the Nintendo Network. Sixty-five people worked with Uemura, whose face wore a constant expression of astonishment. He spoke in a raspy, hushed tone—Tom Waits after a few bourbons—as if what he had to

say was clandestine and dangerous, which it sometimes was. (Yamauchi had tapped Uemura's team for a top-secret project that was kept under wraps for years.)

Takeda ran R&D 3, which would design games such as "Star Tropics." More significant, however, was some of the technical magic the team performed. R&D 3 came up with technology that allowed the other groups to make games that the original Famicom hardware could never have powered on its own. The first Famicom cartridges used what were called NROM chips (N for Nintendo and ROM for Read Only Memory). Unlike computer programs on floppy or hard disks, these programs were not changeable. A game program was reproduced onto an actual integrated microcircuit. Using a photographic process, the circuit was duplicated onto thin silicon wafers that were sandwiched together and attached to connectors. Through them the information—the game program—was transmitted to other components in the system. The amount of information in a game was limited by the size of the ROM.

Each game cartridge had two main chips, one for the program itself, which could be up to 256K (kilobytes) and one for the on-screen characters, which could be 64K. Programs for games and characters had to fit within those chips until R&D 3 designed new kinds of cartridges.

R&D 3 created a cartridge called UNROM, which allowed greater memory size and bank switching. A RAM (Random Access Memory) chip was a place to store information until it was needed by the computer's processor. Bank switching was a process for grabbing, from that stored information, whatever was needed whenever it was needed. A new game screen, complete with new kinds of enemies and waterfalls and creatures (and the programs to make them work) could be retrieved from RAM when the player arrived in that "room."

There were still severe limits on the cartridges, however. The amount of information that could be switched was scant and the process was slow. Takeda's gang tackled the limits with new kinds of chips called MMCs (Memory Map Controllers). They made the system do things that the Famicom's 8-bit processor could never have approached on its own. Years after the Famicom was intro-

duced, games seemed to get more and more complex. It was as if the old Apple II were suddenly powering Hypercard. Takeda's chips, by taking on some of the Famicom's processing power, essentially added RAM and other specific powers to the machine.

The Famicom could do things it was never designed to do: images could scroll diagonally, objects could move quicker, and far more could happen at one time. The system itself still had only 2 kilobytes of RAM, but this was supplemented by the custom-designed sets of circuits with specialized functions in the MMCs. Some of the circuits, called Logic Gates, increased the speed and efficiency of the background computing that made everything happen. Others directed the program to specific locations in the memory, traffic cop style. They were smaller and cheaper than the chips in the UNROM, and they allowed larger program and character memory size. With the addition of the first MMC chip, the potential for more complex and sophisticated games had arrived. The first examples were "The Legend of Zelda," "Metroid," and "Kid Icarus," three breakthrough games, all huge sellers.

Subsequent MMC chips allowed the Famicom to do even more. With MMC3, the screen could split into two parts, each moving independently. With MMC5, there could be more images on the screen at a time. Unaided, the Famicom could project pictures of 960 tiny square pieces, called tiles, but only 290 could be unique, which is why there were so many walls full of bricks or other repeated patterns in early games. MMC5 made it possible for all 960 tiles to be different. It also processed math problems on its own, freeing up the main processor. Memory size for games with an MMC5 shot up to 8 megabytes, thirty-two times more than the original cartridges.

R&D 3 also figured out a way to include a battery backup system in cartridges that allowed some games to store information independently—to keep track of where a player had left off, or to track high scores. The new battery system could store the data for the life of the battery (about five years).

Takeda's group obsessed over the highly technical and the obscure. The fruits of their labors were dramatic—most of the best Nintendo games would not have been possible without them—but

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they were not always obvious. R&D 3, nicknamed "Rumania," was isolated from the other groups. Its motto was grand: "There are no limitations, no boundaries; since we are on our own, there is nothing we cannot do; when you start with nothing you can do everything." Their leader, with his quizzical glances under heavy arching eyebrows and his arcane, light-bulb brain, boasts, "We *have* to have more talented people because we are given unthinkable tasks."

Takeda's twenty-person staff was a band of *otaku*—computer hackers and nerds. They were the consummate eggheads and dweebs. "Becoming maniacs," Takeda said, "is the idea."

The three R&D groups were immersed in their respective projects one day when Yamauchi required the talents of a designer. The project was not important enough for him to pull one of the key members from their work, so he called in the apprentice in the planning department.

Sigeru Miyamoto remembers the maze of rooms in the paper-and-cedar home of his childhood. Sliding shoji screens opened up onto hallways, from which there seemed to be a medieval castle's supply of hidden rooms. The tiny home was in the countryside near Kyoto, in the town of Sonebe, where his parents and grandparents had been born before him. The surrounding landscape was Miyamoto's playground: he fished in the river, ran along the banks of sodden rice fields, and rolled down hillsides.

Across the sand-and-stone street from his home was a rice field. After the yearly harvest, when the field was dry, it became a park for baseball and other games. He played there with neighborhood children in the afternoons, and in the evenings he attended Noh plays, heroic dance dramas, or puppet shows, or he gathered with his family at one of the neighbors' homes for festive dinners.

The Miyamoto family had no television and no car. Every few months they traveled by train to Kyoto to shop and see movies: *Peter Pan, Snow White*. At home, Miyamoto lived in books, and he drew and painted and made elaborate puppets, which he presented in fanciful shows. After school, he often lit out into the countryside for adventure. He had to pass a neighbor's house where a bulldog lay in wait for him. The dog charged every time, barking and snapping, and Miyamoto froze. At the last second, the dog's chain reached its limit and jerked it back. Miyamoto stood just out of the reach of its salivating jaws.

Investigating hillsides and creek beds and small canyons, Miyamoto once discovered the opening of a cave. He returned to it several times before he worked up the courage to go in. Lugging a homemade lantern, he went deep inside until he came to a small hole that led to another cave. Breathing deeply, his heart pounding, he climbed through. He never forgot the exhilaration he felt at this discovery.

The family moved to Kyoto, where Miyamoto and his new friends had secret meetings in the family's attic at which codes and passwords were traded. There were dares to explore forbidden places—a neighbor's yard guarded by an Akita; another neighbor's basement, which held a treasure trove of trunks stuffed with ancient costumes.

Miyamoto wanted to be a performer, a puppeteer, or a painter when he grew up. He carried pads of paper and pencils and drew nature scenes in parks and along the river that divided the city. In school, while his teachers lectured, Miyamoto daydreamed. At night, he constructed plastic models and wood-and-metal contraptions until his father sent him to his room to study. Math and grammar were put aside for drawing.

Miyamoto took cartoon-making seriously. He drew a figure and then invented its life and personality. The figures wound up in intricately drawn flip books. At school he organized a cartoon club that met regularly and had yearly exhibitions.

In 1970, Miyamoto entered Kanazawa Munici College of Industrial Arts and Crafts. It took him five years to graduate because he only attended class about half the time. Instead of studying, he spent his time sketching in his notebooks and listening to records. He loved the Nitty Gritty Dirt Band, the Country Gentlemen, and David Grisman. He taught himself how to play the guitar—American bluegrass music, of all things. It wasn't easy to find a banjo player in Kyoto, but he did, and the duo performed at coffeehouses and parties. His friends were artists and musicians. They hunted in record shops for hard-to-find (in Kyoto!) Kentucky Colonels LPs and traveled to Tokyo to see Doc Watson perform live.

When he finally graduated, Miyamoto agonized over what kind

of job he should get. He had no interest in traditional business, and he knew he would never survive the monotony of a rigidly structured corporation.

Then a revelation came to young Miyamoto. He asked his father to contact an old friend, Hiroshi Yamauchi, who ran Nintendo. The elder Miyamoto asked Yamauchi to meet with his son, a recent graduate with a degree in industrial design, who was looking for a job. "We need engineers, not painters," Yamauchi said, but he agreed to a meeting as a favor to his friend.

Miyamoto was twenty-four in 1977, when he entered the office of the Nintendo chairman. He had shaggy hair, boyish freckles, and a cat-who-swallowed-the-canary smile. He dressed nicely, and he behaved in accordance with traditional etiquette, yet there was mischief and wonder in his eyes. Yamauchi liked the young man and asked him to return for another meeting, this time with some ideas for toys.

Miyamoto returned with a portfolio and a large sack from which he produced a recent invention. It was a clothes hanger designed for children. Nursery schools could have a row of them along the wall, he explained. Or parents could put them in children's rooms. Regular metal hangers, he told Yamauchi, were dangerous for children; the pointed hook could hurt them, even poke out an eye. His hanger, carved out of soft wood and covered with cheerful acrylic paint, was in the shape of an elephant's head. Clothes were hung on the ears and turned-up trunk. The elephant's neck fit snugly like a puzzle piece onto a knob that attached to a wall.

Miyamoto had other hangers as well: a bird and a chicken. Then he showed Yamauchi some drawings for more elaborate toys—a whimsical clock for an amusement park; a swing within a seesaw on which three children could play at once.

Yamauchi saw ingenuity and resourcefulness in the work, and he hired Miyamoto to be the company's first staff artist, even though the company had no specific need for one at the time. Miyamoto was assigned to be an apprentice in the planning department.

When Yamauchi called Miyamoto into his office in 1980 the young man looked down at his hands, his long fingers folded on the smooth table in front of him. He listened intently as Yamauchi told him that he was looking for a video game. Miyamoto had played many video games at college in Kanazawa. He loved them. In video games, cartoons came to life.

He boldly told the Nintendo chairman that he would enjoy creating a game. However, he said, the shoot-'em-up and tennis-like games that were in the arcades at that time were unimaginative, simply uninteresting to many people. He had always wondered why video games were not treated more like books or movies. Why couldn't they draw on the great stories: some of his favorite legends, fairy tales, and fiction—*King Kong, Jason and the Argonauts,* even *Macbeth*?

Nodding impatiently, Yamauchi rushed to the point: A Nintendo coin-operated video game called "Radarscope" was a disaster. There was no one else available to come up with a new game design. Miyamoto had to try to convert "Radarscope" to something that would sell. Yokoi would oversee the project, but Miyamoto was on his own.

After consulting with the R&D 1 chief, Miyamoto returned to his desk with the schematic drawings of "Radarscope," which he found simplistic and banal. Enemy planes approached and players had to shoot them down. Miyamoto threw it away. He asked questions of technicians about the kinds of movements characters could make, the possibilities for different-size characters, and the variations of action and reaction that were possible. Nintendo was negotiating with King Features for the rights to use the *Popeye the Sailor Man* comic as a video game, and Miyamoto was told he could work with those characters. The Popeye license from King Features fell through (although the license was later renegotiated and the Popeye game was made), so he tried other ideas.

He thought about *Beauty and the Beast,* but simplified the story. He came up with his own beast, a King Kong–like ape, a humorous bad guy, "nothing too evil or repulsive," Miyamoto recalls. The ape would be the pet of the main character, "a funny, hang-loose kind of guy" who was not especially nice to the gorilla. "It was humiliating! How miserable it was to belong to such a mean, small man!" says Miyamoto. At his first opportunity, the gorilla escaped and kidnapped the guy's beautiful girlfriend.

The gorilla didn't take the woman to hurt her—an important point in Miyamoto's mind—but to get back at the little man. The man, of course, then had to try to save the girl.

Miyamoto wanted the main character to be goofy and awkward. He chose an ordinary carpenter, neither handsome nor heroic. He wanted him to be Walter Mittyesque, someone anyone could relate to. On a large sketch pad he drew a nose. "Having a nose or not having a nose is completely different," he says. "Noses say a great deal." The nose Miyamoto created was a distinctive bulbous orb made even more noticeable because of the exaggerated bushy mustache beneath it. From one of his old notebooks filled with characters, he chose a pair of large, pathetic eyes.

The engineers had taught Miyamoto that it was important to distinguish the body so it would be visible on a video-game screen. Therefore he clothed his chubby character in bright-colored carpenter's overalls. In order to make the movement obvious in the simple animation of video games, it was important that characters' arms moved, so he drew stocky arms that swung back and forth. The engineers said it was difficult to accurately represent hair in a video game because of inertia: when a character fell, logically his hair would have to fly up. To avoid the problem, Miyamoto added a red cap. "Also," he adds, "I cannot come up with hairstyles so good."

Many of his ideas for the game were rejected by Yokoi; Miyamoto's characters had to do simpler things than he wanted them to. He ended up having the carpenter maneuvering up the unfinished foundation of a building in order to reach the gorilla, who had climbed to the top with the girl. To get there the little man ran up ramps, climbed ladders, rode conveyor belts, and jumped on elevators while trying to avoid the objects the gorilla hurled at him—cement tubs, barrels, and beams.

Miyamoto was nearly finished, but the game needed background music. He wrote it himself, on an electronic keyboard attached to a computer and stereo cassette deck. When the game was complete, Miyamoto had to name it. He consulted the company's export manager, and together they mulled over some possibilities. They decided that *kong* would be understood to suggest a gorilla. And since this fierce but cute kong was donkey-stubborn and wily (*don-*

key, according to their Japanese/English dictionary, was the translation of the Japanese word for stupid or goofy), they combined the words and named the game "Donkey Kong."

Later, when the American sales managers who would sell the game outside Japan heard the name, they looked at one another in disbelief, thinking Yamauchi had flipped. "Donkey *Hong?*" "Konkey *Dong?*" "Honkey *Dong?*" It made no sense. Games that were selling had titles that contained words such as *mutilation, destroy, assassinate, annihilate.* When they played "Donkey Kong," they were even more horrified. The salesmen were used to battle games with space invaders, and heroes shooting lasers at aliens. One hated "Donkey Kong" so much that he began looking for a new job.

Yamauchi heard all the feedback but ignored it. "Donkey Kong," released in 1981, became Nintendo's first super-smash hit.

When Yokoi later needed help with games for Game & Watch, Yamauchi told him to use Miyamoto, since his other designers were busy with their own projects. "I asked him to do creation and I would supervise," Yokoi says.

The computer chips that were affordable and tiny enough to fit into a Game & Watch could store few characters and even fewer movements, so Miyamoto was limited to telling simplistic stories. He adapted a simpler form of "Donkey Kong" for Game & Watch, and after the agreement for the Popeye license was hammered out, he made a mini "Popeye the Sailor Man" game. The latter game has Popeye attempting to save Olive Oyl from Brutus. When Popeye is weakened by too much of Brutus's abuse, he gains strength by downing cans of spinach. Millions of "Donkey Kong" and "Popeye" Game & Watches were sold.

In 1984, Miyamoto was again summoned to the chairman's office. Yamauchi explained that he needed more games, this time for the Famicom. Miyamoto was to head up a new division, R&D 4. The group, Joho Kaihatsu, or the entertainment division, had one assignment: to come up with the most imaginative video games ever.

The decision was one of the smartest Yamauchi would ever make. Miyamoto, it was soon apparent, had the same talent for

video games as the Beatles had for popular music. It is impossible to calculate Miyamoto's value to Nintendo, and it is not unreasonable to question whether Nintendo would have succeeded without him.

After meeting with Yamauchi, Miyamoto returned to his desk. He took a pencil and began sketching the suspendered hero from "Donkey Kong," who had been given the name Mario. Someone had mentioned that Mario looked more like a plumber than a carpenter, so he made the new Mario into one. Since plumbers spend their time working on pipes, large, radiant-green sewer pipes became obstacles and doorways to secret worlds in his next game, "Super Mario Bros."

The brother Miyamoto created for Mario was Luigi, as tall and string-bean thin as Mario was short and fat. That attribute, as well as the color chosen for his overalls (green to Mario's red), was simply to distinguish the two characters on the fast-moving game screen.

"Super Mario Bros." and the sequels Miyamoto designed soon became the most loved video games ever. The "Mario" games were more interesting because there were always new worlds to conquer, each one more magnificent than the last. There are walking plants, fish that Dr. Seuss might have created, dragons, serpents, flying turtles, fire-spitting daisies, and angel wings upon which Mario and Luigi can hitch a ride.

Humor was subtly introduced into the adventure. Miyamoto's mind bent around corners; players' minds follow, delighted. Eventually they figure out that the princess has to ride atop a ladybug if she is going to get to the boss of one level in "Super Mario Bros. 2." (The ladybug looks up her skirt as they head there.) The miniboss of that world—the chief bad guy—spits out lethal eggs larger than his head. In one sequel to "Super Mario Bros.," players have to figure out how to get through a seemingly unreachable door. Mario has to remove some of the coins that are floating in front of the door and take them back to another room to trip a "switch block" that changes the coins into stones. The stones can then be used as steps up to the door. Kids spend hours compulsively trying to figure it out.

Adults enjoy Mario too. They respond, Miyamoto feels, because

the games bring them back to their childhoods. "It is a trigger to again become primitive, primal, as a way of thinking and remembering," Miyamoto says. "An adult is a child who has more ethics and morals. That's all. When I am a child, creating, I am not creating a game. I am in the game. The game is not for children, it is for me. It is for the adult that still has a character of a child."

Miyamoto borrowed freely from folklore, literature, and pop culture—warp zones from *Star Trek*, empowering mushrooms from *Alice in Wonderland*—but his most captivating ideas came from his unique way of experiencing the world and from his memories. When Mario jumps up in space at certain locations, nothing ought to happen because nothing is there, but Mario finds secret, powerful mushrooms and invisible doorways to new worlds. "I exaggerate what I experience and what I see," Miyamoto says.

In the "Mario" games and in some of Miyamoto's other popular games, such as "The Legend of Zelda" and its sequel, part of the adventure is wandering into new places without a map. "When I was a child, I went hiking and found a lake," he says. "It was quite a surprise for me to stumble upon it. When I traveled around the country without a map, trying to find my way, stumbling on amazing things as I went, I realized how it felt to go on an adventure like this." In the games, it often is quite a surprise to come upon a lake amid a forest, a rocket ship hidden beneath the sands of a desert.

"When I went to the university at Kanazawa, it was a totally strange city for me," Miyamoto says. "I liked walking very much, and whenever I did, something would happen. I would pass through a tunnel and the scene was quite changed when I came out." Tunnels in his games are doorways to unexpected things. At the other end of a tunnel the fog may be so thick that it is impossible to see what is ahead. In order to explore the new place, the player must return through the tunnel to search for a hidden torch. Armed with the torch, the player is able to go back through the tunnel and face what is hidden in the fog. In "Super Mario Bros. 3" and "Super Mario World," Mario can fly. However, as in Miyamoto's (and many people's) dreams, he often cannot fly high enough or long enough before he comes crashing down to earth.

There are often great risks attached to exploring the worlds in Miyamoto's games. "I was living in an apartment in Kyoto, and

nearby was a building that had a small manhole cover mounted in the wall," Miyamoto remembers. "I walked by it every day and I noticed it. I wondered, Why is a manhole on the wall? Where does it lead?" Miyamoto never found out, but in "Super Mario Bros.," when the player encounters a manhole, he can choose to do what Miyamoto never did: open it and go inside. To do so is worthwhile.

Miyamoto as a child had worked up the courage to go beyond the periphery of the forbidding cave he had discovered. "The spirit, the state of mind of a kid when he enters a cave alone must be realized in the game," he says. "Going in, he must feel the cold air around him. He must discover a branch off to one side and decide whether to explore it or not. Sometimes he loses his way." Not just the experiences but the *feelings* connected to those events were essential to make the game meaningful. "If you go to the cave now, as an adult, it might be silly, trivial, a small cave," Miyamoto says. "But as a child, in spite of being banned to go, you could not resist the temptation. It was not a small moment then."

In Sonebe, Miyamoto had once climbed a tree and gotten high enough to see far-off mountains before he realized that he was stuck; there was no way he could get down. Super Mario gets himself into similar fixes all the time. Once while fishing when he was a young boy, Miyamoto reeled in a bony, grotesque little fish with snapping jaws. Mario encounters the fish that Miyamoto as a child *imagined* he had hooked: a monstrous creature that would happily devour him.

The memory of being lost amid the maze of sliding doors in his family's home in Sonebe was re-created in the labyrinths of the "Zelda" games, while in the Mario series Miyamoto made safe places that felt like the haven of his parents' attic. The dog that had terrorized him when he was a child attacks Mario. "I am especially proud of the dastardly, repulsive characters," he says. Miyamoto's dream was to make games that created worlds in which game characters could be more like players' companions, seemingly independent. "Perhaps they can even be ourselves at other times in our lives," he explains obliquely.

Older and more sophisticated players often miss much of the magic in the games. Young children, who do more leisurely exploring, and quiet and thoughtful children, who are more contempla-tive, have a better chance of finding hidden secrets than the kids who blast through, charging toward the goal. "The players must be thinking, 'Well, I don't see anything here, but it can be, it's possible.' Then the player is curious enough to visit that place. When he finds something he never expected, he feels, 'Ah, I did it. I made it.' It's a great kind of satisfaction."

The most wondrous surprises are timed to occur at intervals that keep things hopping. It is worth going forward because something good is waiting around the next corner, or in the next world. Some of the secrets are so well hidden that it is a miracle kids find them at all. Each level of each game ends with a flagpole, but a secret whistle in "Super Mario 3" is hidden *beyond* and above the flag-pole—in a place that seems to be outside the game, or at least outside the part of the game that can be seen on a television screen. It is as if Mario has to fly out of the television set for a while until he reaches the entrance to a secret room. Who would ever think of trying it? Those who do are amply rewarded. The whistle gives Mario the power to travel to any world in the game at any time.

Many of Miyamoto's subsequent games not only had the same characters and roughly the same goals, but built on the skills that were learned in the preceding games. There were many new lands and new tricks, and with them the sense of accomplishing new things, yet there was also the comfort of not having to learn a game from scratch.

At Nintendo, Miyamoto's stature increased. After being made the director of his first games, he earned the title of producer. It meant a great deal to him: he had the same title as his idol, George Lucas (*Raiders of the Lost Ark* was Miyamoto's favorite movie). Now, instead of working on one game at a time, he oversaw the production of several, each budgeted at more than $1 million. From six to twenty people worked on each game for a period of twelve to eighteen months.

Technology eventually progressed to make some of the produc-tion stages easier. Originally Miyamoto had to paint each charac-ter. The colors in the painting were given numbers and the numbers were inputted into a computer, dot by dot. He showed

programmers not only how the character looked but how it moved and what special traits it had (a bee, when hit, lost its wings but continued to stalk Mario; boats made out of skulls sank into a fire pit). The characters and their movements were written, line by line, as instructions in a computer program.

Tools were developed to eliminate much of the tedious work. Diagrams and drawings were translated into computer graphics with technology called Character Generator Computer Aided Design (CGCAD). "Character banks" of images were stored along with the codes that described them. Movement, too, was now programmable from a bank of choices.

Miyamoto was a terrible manager of his division; he needed an assistant to keep everything and everyone organized. Nonetheless, he oversaw all aspects of the creation of the games. He wrote the scripts and then worked with editors, artists, and programmers. When a game was nearly completed, he spread out its blueprint across a room full of tables that had been pushed together. The blueprint was the map of a game's pathways, corridors, rooms, secret worlds, trapdoors, and myriad surprises. Miyamoto lived with it for days, traveling through the game in his mind. As he went along, he determined which points were too frustrating or too easy. He added mushrooms or a star to make Mario invincible. He made certain that the moments that gave the greatest delight—a dinosaur that hatched from an egg, a feather that let Mario fly—came at sufficiently frequent intervals.

When he had edited a game to his satisfaction, Miyamoto went back to his director and technicians and had them incorporate his revisions. They worked for many days and nights on the changes, testing idea after idea, until Miyamoto was happy with the pacing.

When the game was ready, it was scored. Music was just as important for a game as for a movie: the same world could seem scary or lighthearted, depending on the music.

Miyamoto worked with a professional, in-house composer, most often with a brilliant young musician named Koji Kondo, who wrote the music for all the "Super Mario" games. Kondo's music became so popular that recordings of his Nintendo music were successful CDs and records. (In Tokyo, a symphony performed Kondo's "Mario" music, and the Jamaican reggae singer Shinehead borrowed the "Mario" theme for the chorus of a rap song.)

After the music was added and the final edit completed, Miyamoto's games were ready. Kids were waiting. Between 1985 and 1991 he produced eight "Mario" games. An astounding 60 to 70 million were sold—either individually or packaged with hardware as an incentive to buy Nintendo systems—making Miyamoto the most successful game designer in the world. One designer suggests it is because he is left-handed. Miyamoto shrugs: "I think it is nothing more than destiny."

As his games' popularity grew, Miyamoto became well known in Japan and beyond. Westerners who made the pilgrimage to Kyoto to meet him included Paul McCartney, who, during a Japanese tour, said he wanted to see Miyamoto, not Mount Fuji. As a fan of the Beatles, especially *Abbey Road,* Miyamoto was thrilled, although he was never quite able to fathom the attention he received.

Meanwhile, Miyamoto had met a woman named Yasuko, who worked in Nintendo's general administration department. They dated and soon married. He had been living in a nearby Nintendo dormitory, and he and Yasuko moved into a small house near Nintendo's office. From there he walked or rode a bicycle to work. Yasuko stopped working when the first of their two babies was born. The family would walk down the street in Kyoto, and his fans, who reverently call him Dr. Miyamoto, often stopped him to pay homage. Miyamoto didn't change much. Even when he was approaching forty and started cutting his hair shorter (although no one would ever call it neat), he remained unassuming and shy. His mind never stopped wandering to new places—places that were recreated in his newest games.

In spite of a string of hits made by Miyamoto and by the other R&D groups, Yamauchi still was unable to meet the demand for games. Retailers were turning away hordes of customers, which distressed them. Yamauchi himself feared that customers who couldn't get enough games would move on to other forms of entertainment, perhaps a competitor's video game system. How, he wondered, could he increase the number of games available?

Many companies, mostly producers of video-arcade or floppy-disk computer games, had approached him, but Yamauchi hadn't wanted to relinquish any control over the games. If games of poor quality were released, his customers would become disappointed with the Famicom. But the real reason he didn't want other companies to produce games for his machine was that they would make piles of money, and Yamauchi wanted it all for Nintendo.

4

INSIDE THE MOTHER BRAIN

In a moss-carpeted park in the center of Kyoto's business district, amid still-dormant cherry trees, a man in a dark suit sipped tea and wrote haiku. The business day seemed to have thawed away into a tranquil pool of deliberation.

Across the street, in lounges, men sat before tall bottles of beer and delicate cups filled with warmed sake. The frenetic day shaken off like a brittle cocoon, the men felt replenished, even as the poet in the park took up his pen. A line of carbon-black ink assaulted the white parchment before him.

Night fell and an electric day was born in the Las Vegas blinking of the pachinko parlors and the electric street lamps, the spotlights on billboards, and the neon announcements for Coca-Cola and Sony. The poet vanished, but many of the businessmen ducked into nearby karaoke bars, where pretty, young hostesses giggled and made small talk and poured the next drink. Men—by day stern and forbidding—took turns climbing up on stage, where they took