

Mouse Balls · Rainbow

Kazutoshi Otani · Mouse customizing book

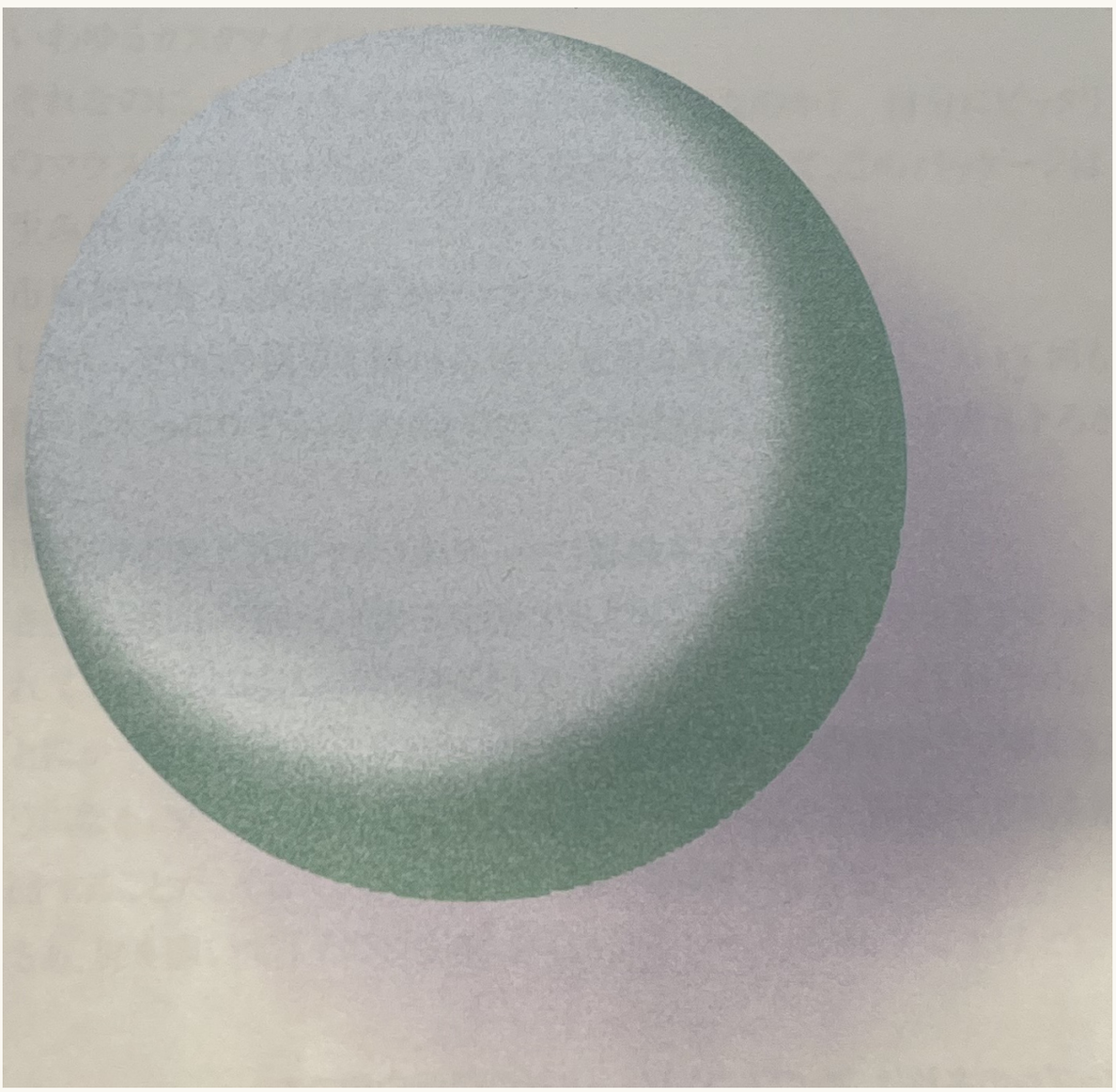
English edition · ASCII, 1996 / 1997

Mouse Balls · Rainbow

Kazutoshi Otani

BALLS FOR MOUSE

ASCII Publishing



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English edition prepared from photographs of the Japanese book. Page numbering, historical information and prices follow the 1996/1997 original. Text has been translated and typeset anew; photographs and illustrations are reproduced from the book.

Preface

Some people buy a car and immediately replace its wheels or tires. Others buy clothes and change the buttons or put in shoulder pads. Still others buy shoes and promptly change the laces or get out a shoe stretcher.

There are people who know how to make mass-produced objects distinctly their own.

Personal computers are no different. Look at people's desktops: there are as many variations as there are users. Many install utilities and begin building a system to suit themselves. That is what we call customization.

But why should a mouse stay exactly as it was when it left the shop? Could we make it fit you perfectly? This kit is our answer to those questions.

It is the first set of mouse balls of different weights ever offered on the market.

Yet even people who wonder about such things often know very little about their familiar companion, the mouse. That is why this little book was written especially for the kit.

It is the first explanatory book on the market devoted to the mouse.

To keep your mouse pleasant to use for a long time, we have also included a cleaning brush. There have been precedents for that, so we shall quietly call it a bonus.

From today, then, computer users will have two new habits: changing the ball when they buy a mouse, and regularly cleaning its interior. This book explains how.

Open it, and turn “that mouse” into “my mouse.”

March 7, 1996

Kazutoshi Otani

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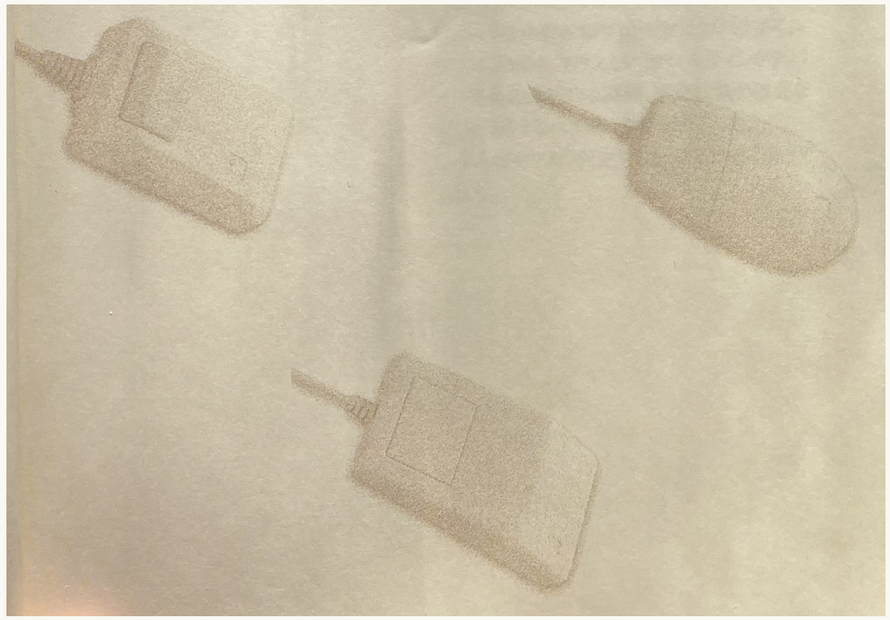
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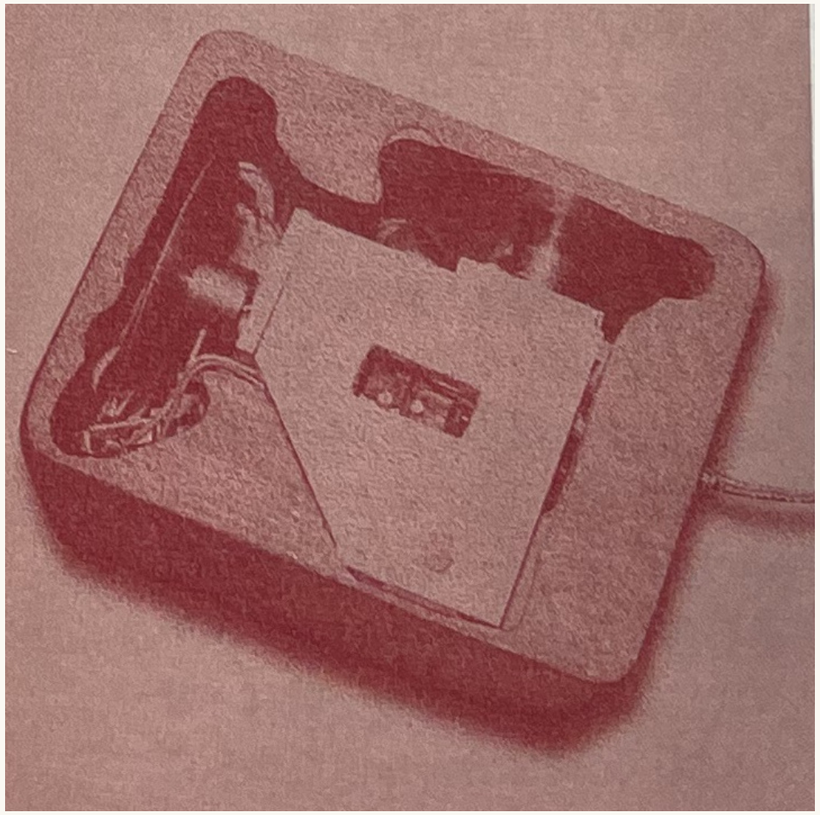


A brief history of the mouse

Today, a mouse is taken for granted as part of a computer, and shops offer a wide selection of replacements for the standard model.

But there were many obstacles on the way to this widespread acceptance. Ideas about the computer's role and how people should use it had to change; the industry had to recognize the mouse as a pointing device; and manufacturers had to master the technology needed to produce it.

Let us look back briefly at the history of the mouse.



Before the mouse

Looking back at computer history, ENIAC, the world's first digital computer, was completed in 1945. Whenever it was to perform the ballistic calculations for which it had been built, its program was changed by physically reconnecting electrical circuits.

Because changing the connections between the preassembled circuits specified both the program and the data, there were no separate input devices. The machine's direct user was the programmer, who also gave the instructions for rewiring it.

ENIAC was soon followed by stored-program computers. In this architecture, the circuits remain unchanged while instructions are stored in internal memory and then executed. Punched paper tape and punched cards were used to record instruction sequences and enter them into the machine. The holes that encoded information on these paper media were punched with devices resembling typewriters. This was the first encounter between the keyboard and the computer.

As the arrangement itself makes clear, however, the keyboard was not yet connected directly to the computer. It remained part of a typewriter-like machine, used to prepare programs and data indirectly.

The keyboard became familiar as a directly connected input device only with the spread of CRT displays, which could show input without using paper, and time-sharing systems, which accepted input from several terminals in parallel.

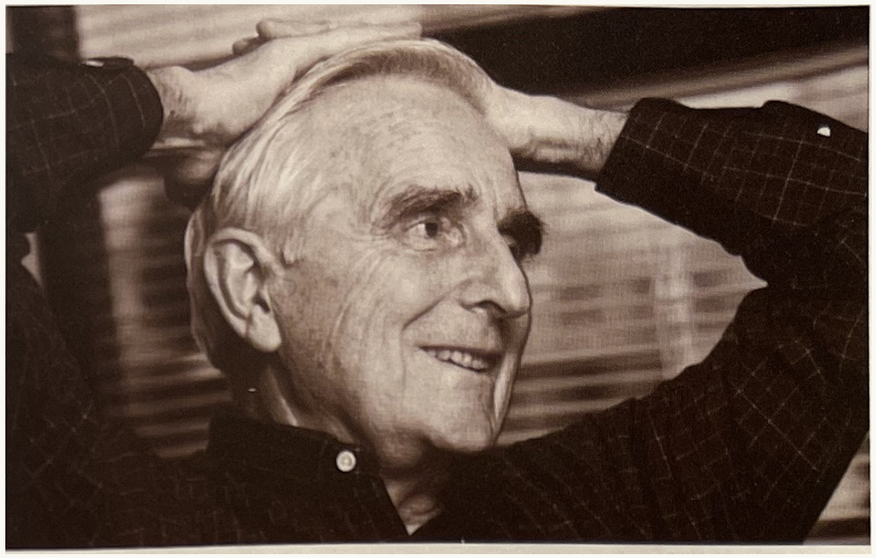
The word “computer” originally meant something that computes. A keyboard was quite sufficient for entering numbers as data and textual instructions for operating on them. Even today, it is difficult to name a better way of entering numbers and letters.

By the late 1950s, however, researchers were using increasingly powerful computers not only for numerical calculations but also for editing text and creating and processing graphics. As a result, operating the computer and issuing commands became more important. Engineers responded by developing pointing devices, intended primarily for controlling the computer rather than entering data.

All this was still research, however, concerned with particular specialized tasks. Nobody yet imagined ordinary users employing a general-purpose pointing device. Indeed, nobody imagined a computer having an “ordinary user” at all, so that was only natural…

The father of the mouse

Douglas Engelbart



It was only in the 1960s that entering data through a keyboard connected directly to a computer became commonplace.

Around the same time, in 1962, Ivan Sutherland, often called the father of computer graphics, developed the experimental Sketchpad system. It allowed users to create and edit images on a screen with a light pen.

People who saw Sketchpad are said to have realized that computers could do more than conventional data processing. Just what else they could do, however, remained unclear.

One man had “known” the answer since the 1950s: Douglas Engelbart, a radar specialist with a degree in electrical engineering. He recognized early that computers could extend human intellectual abilities and expressed the idea with the word “augmentation.”

In 1964, at the Stanford Research Institute, Engelbart obtained funding from the US Department of Defense's Advanced Research Projects Agency to establish ARC, the Augmentation Research Center. This was the first step toward the information environment he envisioned.

Through his research at ARC, he and his talented colleagues created the interactive computer system NLS, the oN Line System. It won some recognition within the institute, but Engelbart felt that there would be no real achievement until the system reached the outside world.

The mouse makes its debut

Engelbart finally decided to demonstrate NLS publicly at the 1968 Fall Joint Computer Conference. Before an audience estimated at three to four thousand, the idea of augmenting human intellect was revealed in its full scope.

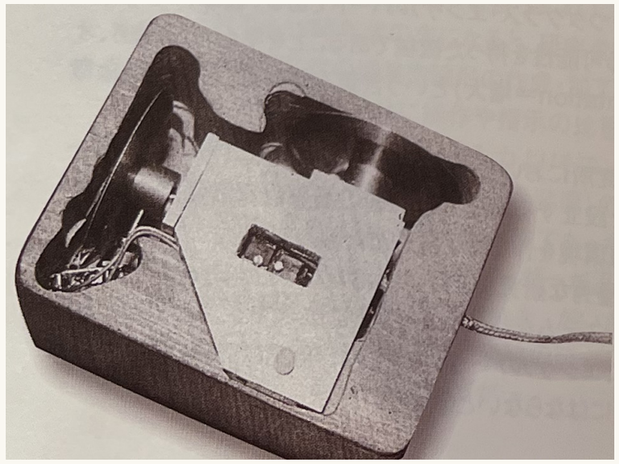
He sat alone on the stage before a CRT monitor, wearing headphones and a microphone. A projector showed his image in real time on a huge screen behind him. Such a scene is familiar from presentations today, but this production, using the latest equipment, astonished everyone present.

At the center of the NLS console was an ordinary keyboard. On the left were five keys for special commands; on the right was an unfamiliar palm-sized box with a cable. This was the world's first mouse, developed by Engelbart together with his colleague Roger Bates. The developers themselves called it a hand-operated cursor controller.

Engelbart's mouse was made of wood. Two perpendicular disks turned through friction against the desktop and moved the cursor. A single button sat at the corner beneath the index finger.

Using the mouse with his right hand and the five keys with his left, he opened and divided windows one after another, displaying documents and images inside them. At that moment, Engelbart became what we might now call a pilot of cyberspace: the abstract theoretical idea of an “information space” took visible form.

After the two-hour presentation, the audience gave him a standing ovation. Alongside NLS, the mouse had made a brilliant debut. That was 28 years ago.



Engelbart’s mouse

PARC and the mouse

Later, Engelbart pursued his own concept of intellectual augmentation so single-mindedly that he gradually moved away from the mainstream of the computer world. During the 1970s, intellectual leadership passed to Xerox's Palo Alto Research Center, the famous PARC.

This center for advanced computer research opened in 1970. Robert Taylor played a key role: while working at the Department of Defense's Advanced Research Projects Agency, he had made the decision to fund Engelbart's ARC. PARC brought together leading researchers, including Alan Kay, known for the Dynabook concept, and John Warnock, who later created PostScript.

Taylor and his colleagues worked to turn Engelbart's ideas into a practical system. In 1974, they completed the experimental Alto computer. NLS had relied on an enormous computing installation, whereas Alto was so compact that it was called the world's first personal computer system, even though its main unit was still a box roughly 60 by 60 centimeters in size.



PARC research center

From prototype to working system

The most important advance was that Alto did not remain a single prototype. More than two thousand machines were built and used over the next five years. Their users were limited, however, to Xerox divisions, certain universities, and government institutions, including the White House.

Alto naturally had a mouse: a mechanical model with a ball and three buttons. It also brought together a bitmap display, a more advanced windowing system, icons, pop-up menus, and other technologies that formed the basis of today's graphical user interface, or GUI.

The NLS mouse had chiefly been used for pointing and selecting; actions on the selected information were specified with the separate five-key device. Alto's mouse could operate menus as well. This greatly expanded its role, while the division of labor with the keyboard, responsible for data entry, gradually became clearer.

The mouse reaches personal computers

Although Alto was revolutionary, personal computers were not part of Xerox's sales plans. In the mid-1970s, the consumer market was indeed not ready for them, and the company wanted to sell office workstations, or systems for preparing and managing documents.

The researchers were unhappy about this. Larry Tesler, one of Alto's developers, even believed that the product would never reach the market under Xerox management.

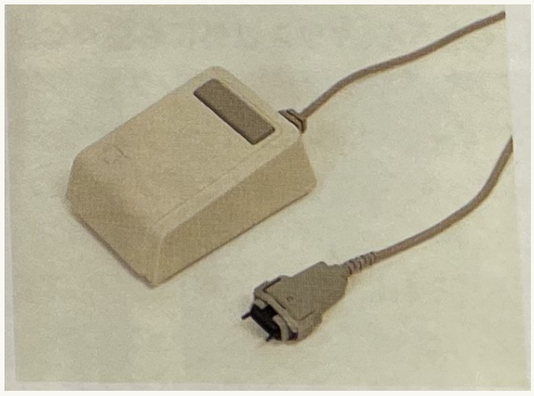
In the second half of 1979, a group of engineers led by Apple founder Steve Jobs visited PARC. They grasped Alto's possibilities faster than any previous visitors and bombarded Tesler with perceptive questions. As a result, Tesler and other key developers moved to Apple, where they worked with personal-computer specialists to turn the technology into a commercial product: Lisa, aimed at business executives.

Released in 1983, Lisa inherited Alto's basic ideas but introduced innovations of its own: pull-down menus, movable icons for directly manipulating files, and a trash can. These made the environment easier to use. A mouse was supplied as standard, but it had only one button so that users could not press the wrong one.

At about ten thousand dollars, Lisa was too expensive to succeed commercially. Nevertheless, it introduced a broad audience to the GUI and the mouse. In January of the following year, Apple introduced the more affordable Macintosh, based on Lisa's technology, and established its own market. The one-button mouse remains one of the company's symbols.



Apple Lisa



Lisa mouse

Other platforms and input devices

In the MS-DOS world, Lisa was followed by the NEC PC-100, the first Japanese personal computer to include a mouse as standard. In 1985, Microsoft released Windows 1.0, opening the prospect of a mouse-operated environment for IBM PC-compatible machines.

The PC-100 mouse was also designed to Microsoft's specifications and had two buttons. Since then, Microsoft's family of mice, including Windows models, has retained the two-button arrangement.

Interestingly, UNIX workstations commonly use three buttons, perhaps reflecting Alto's influence. There was even a five-button mouse: if we have the fingers, why not use them all?

Through gradual refinement, the mouse became the most widespread pointing device in computer history. Other devices exist, however: joysticks, trackballs, touchscreens, graphics tablets, touchpads, and light pens.

A joystick resembles a miniature aircraft control stick. Some models detect only the direction of deflection; others relate the tilt to a position on the screen or to the force applied by the user. It is convenient for games, but its accuracy and handling characteristics have limited its use in ordinary work. Recently, however, devices resembling very short joysticks have appeared in some notebook computers.

The trackball is often described as an “upside-down mouse,” although it predates the modern ball mouse. The user turns an embedded ball with the palm or fingers; its direction and speed determine the pointer's relative movement. A trackball takes up little space and handles straight-line motion well, but is less suited to curves. Its compactness has led to increasing use in notebook computers.

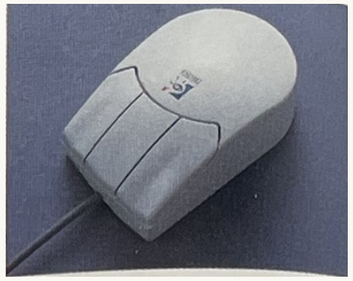
A touchscreen, or touch panel, lets the user point directly at the screen with a finger. Such devices are common in automated teller machines. One method locates the finger by detecting an interruption in an infrared grid in front of the screen; another uses a special film whose electrical resistance changes under pressure.



NEC PC-100



Two buttons



Three buttons

Alternatives to the mouse

A touchscreen is intuitive but unsuitable for fine work, and its surface quickly becomes marked with fingerprints. Nevertheless, pressure-sensitive screens used with a special pen are becoming increasingly common in portable information devices because they are simple and convenient.

A graphics tablet consists of a flat working surface and an electronic pen or a coordinate device with crosshairs. Position is detected from changes in the surface's magnetic field caused by the pen. Tablets are used in CAD, where precise coordinates matter, and for drawing that requires delicate strokes. Their disadvantage is the relatively large area they occupy.

A touchpad is like the sensitive part of a touchscreen separated from the display. It resembles a tablet, but is operated directly with a finger and has lower resolution. Both capacitive and pressure-sensitive models exist, and small touchpads are beginning to be built into notebooks.

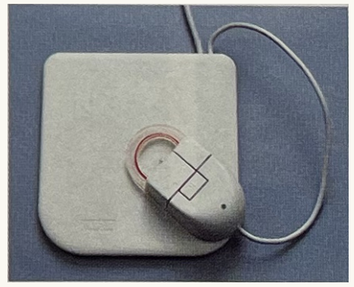
A light pen has a light-sensitive element at its tip. When it touches a monitor, it detects the moment when the electron beam illuminates the phosphor at that point, allowing the coordinates to be calculated. With a graphics program, it feels like drawing directly on the screen. But working on a vertical display tires the arm, and the rather broad tip obscures the selected point.

Each device has advantages and disadvantages, yet none has become as popular as the mouse for general-purpose control. The likely reason is the mouse's exceptionally intuitive and unrestricted operation.

The mouse uses relative coordinates, with its current position becoming the starting point each time. Once accustomed to it, one can work even in a small area. Its lack of absolute precision is easily compensated for by visually correcting the pointer's position. These are distinctive strengths of the mouse, and today's scale of mass production makes it hard for other devices to compete on price as well.



Trackball



Graphics tablet



Touchpad

The evolution of the Mac mouse

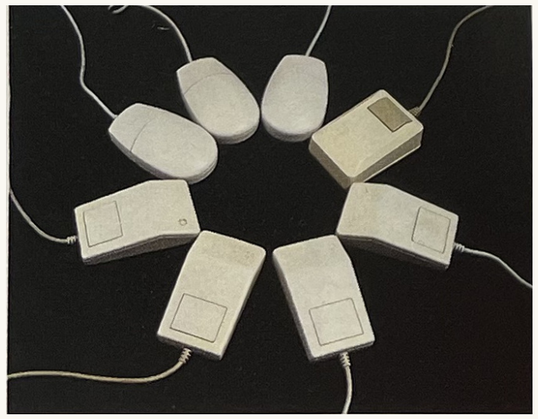
A little background. Macintosh mice up to the Plus, through 1986, descended from Lisa's design. External changes mainly accommodated differences between Lisa and Mac cases, such as the shape of their bevels.

Mice were then tall and angular: the palm rested on top rather than wrapping around the body. Matching the computer's appearance mattered more than ergonomics. The ball lay roughly beneath the base of the index finger, and the button's microswitch had a long travel and a fairly stiff action by today's standards.

The Apple II mouse, developed after the Mac appeared, inherited this basic design. Its body was rounder, however, and seemed to have shed unnecessary bulk, foreshadowing later changes.

In 1987, alongside the expandable Mac II and SE, Apple introduced the Apple Desktop Bus, or ADB, for input/output peripherals, together with a corresponding mouse. It was smaller and thinner than its predecessors. Longtime users initially missed the familiar heft, but its low front button reduced finger strain. As users grew accustomed to the lighter action, their opinions reversed.

The current rounded ADB Mouse II arrived in January 1993 along with the Adjustable Keyboard. Officially, its basic mechanism was unchanged from the previous ADB mouse, but moving the ball forward allowed more precise fingertip control, while the unusual shape fitted the palm better.



Mac mice across generations



Underside

Small differences within the same family

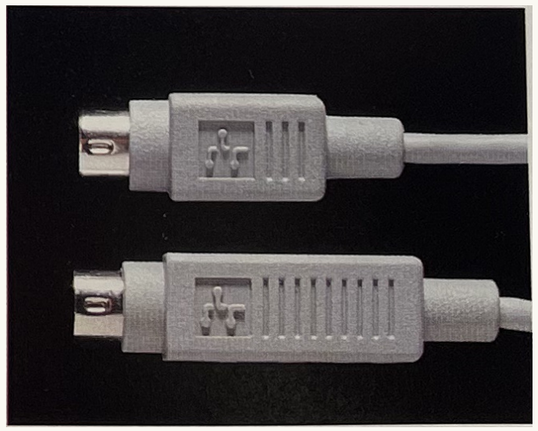
The evolution of mice since the move to ADB is interesting. Officially, there was only one model change: from the ADB Mouse to the ADB Mouse II. In practice, particularly with the first model, there were lightweight versions and versions with interference suppression for use on aircraft. Even mice made at the same time differed in parts such as the ball-compartment cover, depending on the country of manufacture. This seems rather strange, since a single worldwide design would presumably be more economical.

A well-known lightweight version has a black ball made of a material resembling foam rubber. Compared with the heavy dark-gray ball, the difference is almost like that between iron and wood. The position and material of the internal rollers also differ. The lightweight version requires less effort but slips more readily on some surfaces, so it does not suit everyone.

The interference-suppressed version came with the Mac Portable and has a longer ADB connector than usual. It is said that delays in developing this version caused the first Portables to ship without a mouse.

The editors also found standard and lightweight versions of the ADB Mouse II, distinguishable in the same way. A model's part number is identical regardless of country of manufacture or minor differences, so one cannot order a particular version. On the other hand, exchanging information with friends and finding the mouse that suits you is part of the fun. Organizations with many computers offer an especially good chance of finding a rare variant.

From HyperLib, May 1995.



Connectors: ADB and Macintosh Portable



ADB Mouse II variants

A catalog of conventional and unusual mice

In the roughly thirty years since its birth, the mouse has changed its shape to suit its surroundings and produced a multitude of variations.

Here we introduce some representative examples of the latest generation of mice.



Original catalog illustration

Basic mice

NEOS ONE'S

The simplest mouse in this selection. Its actual selling price is ¥1,980. Resolution is 350 cpi, or counts per inch, which is quite sufficient unless you do especially delicate work.

Ball: 19 mm. KT-60 · Nihon Electronics · ¥2,500.





COMFORT

A conventional design with a resolution of 400 cpi. In clothing terms, its simple, unobtrusive appearance is understated classic style. For people who do not chase novelty but appreciate solid basic performance.

Ball: 22 mm. MA-401MAC · Sanwa Supply · ¥3,800.

Designer mice

ERGO MOUSE PRO

An ergonomic mouse by master industrial designer Luigi Colani. To fit the palm precisely, it is deliberately designed for a particular hand. A must for Colani fans and those who put design first.

Ball: 22 mm. MA-MAC · Sanwa Supply · ¥6,800.





LUNARIS

A design by Frog Design, responsible for the Sony Walkman II and many well-known computer products. The price is high, but a circular control underneath lets you select a resolution between 50 and 1,600 cpi. It has plenty of functionality to match its looks.

Ball: 21 mm. M-LMA · Elecom · ¥9,800.

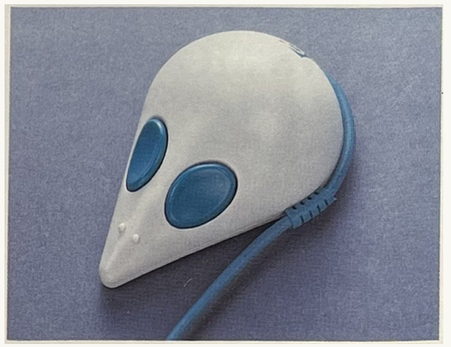
Mice for different needs

Mouseman

A three-button mouse shaped for a particular hand, although not as radically as Colani's design. A left-handed version is also available. The supplied software lets users assign the extra button's function: a model for customization enthusiasts.

Ball: 22 mm. Logitech Pacific · ¥6,800.





Kid's Mouse

If you have children, you are sure to want one of these. Its “tail” is deliberately directed toward the user, and its ears serve as buttons. It is a little small for adults, but also makes an attractive decoration.

Ball: 12.7 mm. Logitech Pacific · discontinued.

MOUSE PRO TC-38M

For notebook owners tired of mice that are all white. Designed for the Mac (PowerBook), it also suits anyone who wants a mouse to match a gray computer. Its slim body is convenient for travel, although its resolution is only 260 cpi.

Ball: 22 mm. TC-38M · Tech Parts · ¥3,600.





Optical Mouse

An optical mouse has no need of our cleaning kit. Its advantage is that dirt does not get inside. However, it works only on the special pad supplied with it, so there is no pleasure in choosing a pad. You might call it a maintenance-free mouse for getting work done.

HISTORICAL INFORMATION AND PRICES RETAINED FROM THE ORIGINAL EDITION

Unusual mice

BEETLE MOUSE. A mouse shaped like a beetle, with a resolution of 320 cpi. Despite its appearance, reviewers overseas rate its usability highly. A brightly colored version decorated with the American flag is also available. Ball: 19 mm. Approximate price: $35.





SPORTS MOUSE. Choose a soccer ball, baseball, basketball or American football, with a matching playing-field mouse pad. The buttons are hidden beneath the cover: ease of use is sacrificed to appearance, but it is certainly a conversation starter. Ball: 22 mm. MOUSE MUS-SKM · Loas · ¥4,800.

Yubita-kun. Not a mouse, but a separate trackpad like those becoming popular in notebooks. Move a finger over the surface or tap it. Trackpads may be capacitive or pressure-sensitive; this is the latter type. It suits anyone whose mouse takes up too much space, but requires a different habit. Minolta · ¥7,800.





Wooden mouse. Each is hand-carved from real wood, in a choice of karin, maple or walnut. A fine gift or keepsake! Ball: 22 mm. Art Arts · ¥14,000–15,000.

Numbers in parentheses in the original indicate the ball diameter in millimeters.

The birth of the Japanese mouse

We asked Alps Electric director Tetsuhiro Seino how the Japanese mouse came into being. His company developed it in Japan and manufactured mice for the entire world.

Tetsuhiro Seino. Director, Alps Electric. At the company's Wakuya factory he developed volume controls; their operating principle provided the starting point for a mouse.



Original interview illustration

It began with a micromouse

Otani: How did development begin?

Seino: In 1982, maze-solving robots called “micromice” were popular among microcomputer enthusiasts. I thought we could turn a trackball upside down, add a motor and send it around a maze. Trackballs already existed.

Just then Apple introduced the Lisa, and information about it began reaching us. The Lisa had a mouse. We realized, “It seems you hold it and move it by hand.” We began developing that kind of mouse rather than a robot.

Otani: So you started by developing a sensor for a robot?

Seino: Yes, that was the original idea. Gradually we came to understand what a mouse should be. Our Yokohama factory made personal and office computers and was among the first to acquire an MS-DOS license. Without software, the mouse risked remaining merely a sensor. We decided the market would not grow without cooperation with a company that understood software.

That led us to Microsoft. Almost none of us, however, realized how strategically important a product the mouse could become.

“Just show me the mouse.”

Seino: We held an Alps Show every other year. The mouse wasn’t on public display; we kept it under the table to show promising customers. Someone told Mr. Nishi of ASCII, who was then a Microsoft vice president, that Alps had a mouse. He came to the trackball display and introduced himself: “I’m Nishi from ASCII. First of all, I want to see the mouse.”

He had come specifically for it. But we had little experience in the computer business. It is embarrassing to say now, but many of us knew neither ASCII nor Mr. Nishi. The employee at the stand therefore refused to show him the mouse.



Tetsuhiro Seino

Trying the mouse with Bill Gates

Seino: Fortunately, another employee demonstrating a different product was a computer enthusiast and knew both ASCII and Mr. Nishi. Thanks to him, Mr. Nishi saw our prototype for the first time.

Otani: It’s hard to imagine that happening today!

Seino: Even the word “mouse” wasn’t widely known. Mr. Nishi, of course, knew we were working on one. Microsoft in Seattle was already developing software for the Lisa and was probably investigating what a mouse was and what software it needed. I think that is why Mr. Nishi took an interest in our exhibition. That was how our collaboration began.

When I visited Microsoft, it had about 200 or 300 employees. Mr. Nishi, Bill Gates and I sat on the floor around a glass coffee table, trying the mouse and saying, “It’s moving!” That was fourteen years ago.

The price of a mouse.

Seino: Today the OEM price is five or six dollars. Back then our cost was under ¥2,000, and we planned to sell it for about ¥2,500. But Mr. Nishi said a good product should command a good price: ¥10,000, when a keyboard cost ¥7,000. I worried that nobody would buy a mouse that cost more than the keyboard beside it.

I immediately spoke to the engineers: if we were charging ¥10,000, we should change the internal construction. We fitted five precision-instrument bearings, including bearings on the encoder shafts, at several tens of yen apiece. The mouse looked expensive. They were not particularly necessary for good movement, but helped justify the price.

It started as a dream.

Otani: Did you expect to sell large numbers?

Seino: At first it was only a dream! Gradually we understood what a mouse was; visiting Microsoft and talking to Bill Gates gave us hopes of a major business. But inside our own company there was little understanding. The mice sold even at ¥10,000, made a profit and attracted attention. Without good software, though, the mouse itself would not sell. The NEC PC-100 brought the first surge in shipments…

Making the green-button mouse

Seino: …then sales were quiet for almost a year. Every new piece of software gave them another boost.

Otani: How did you explain the mouse to people in the company?

Seino: We showed them the PC-100. Some heard the word “mouse” as the English word “mouth.” The Japanese launch was twelve years ago, in the Year of the Rat, so we joked that they would multiply like mice.

Otani: How did you decide on the size?

Seino: A larger one was easier to make at first. Mr. Nishi and the Microsoft engineers wanted a compact mouse in a particular shape. I liked their design too. I tend to take the customer’s side quickly, so our engineers had a hard time.

Microsoft insisted on that shape, and I repeated the demand. The engineers spent two sleepless nights drawing while Mr. Nishi and I went to dinner in Ishinomaki. Eventually they decided it was feasible. That became the green-button Microsoft Mouse.

Bill Gates visits the factory.

Seino: Bill Gates came twice. He was about thirty and read a mathematics textbook on the trip from Tokyo to Miyagi. We had started production at Alps and then contracted it out. The partner’s factory had fewer than 150 employees, and you could see pig and chicken sheds outside the window. I explained Japan’s two-tier manufacturing system: subcontractors and factories like this made the quality products on which Japanese industry depended.

After the tour, we stopped the line and he spent about ten minutes thanking everyone. Today everyone probably knows him, but the women at the factory then remembered a young American who gave a speech of thanks and shook each of their hands…



Tetsuhiro Seino

From bare steel to rubber

Seino: …I regret that we didn’t take any photographs. He came twice, and the workers took pleasure in making mice. For a time, Alps was making mice for the whole world, whatever brand was printed on them.

Otani: Today the ball is usually 22 mm. What was it before?

Seino: One inch—25.4 mm. It needed enough weight to roll. We didn’t yet have the rubber-coating technology, so it was bare stainless steel. It rattled in transit, and we inserted a urethane foam ring to hold it still. The instructions said, “Remove the urethane rubber before use.”

NEC wanted a quieter mouse with a better ball, so we switched to rubber-coated balls. But reprinting the instructions would have cost money, so we kept the foam packing too. About twenty mice came back: after removing the packing, people had peeled the rubber off the ball as well, just as they thought the instructions told them to! We hadn’t anticipated that misunderstanding.

Otani: Why did you move to 22 mm?

Seino: We reduced the encoder’s resistance to turning and improved the contact surfaces, so less driving force was needed. A heavy ball makes your hand tired. Then we found a company skilled in molding urethane, and the rubber ball proved easier to use.

It did collect more debris, though. Stainless steel scarcely got dirty, so we had not given cleaning much thought. Rubber began picking up lint and dust from the desk…



During the interview

Will anything replace the mouse?

Seino: …so we changed the rollers' contact surfaces and considered a cleaning kit. A smaller ball requires less effort. We assumed people would use the mouse without a pad, so it had to pass tests on a glass desktop. There was what we called the D effect: a circle came out as a D because movement along the X axis was weak. It had to draw a circle properly on glass.

Otani: What about the future?

Seino: Trackballs and GlidePoint aren't really replacements. For a desktop computer, the mouse is still the most natural, general-purpose device. There are touch panels too, but the mouse is most convenient at a desktop.

Notebooks, with their limited space, will have various input methods. Voice looks impressive, but requires very high recognition accuracy, and office noise makes that difficult. The mouse has been sold for twelve years in Japan and thirteen in America, and still holds an important place among input devices. If it were inconvenient, it would have disappeared long ago. I think it is a very well-developed device.

Otani: What weight do you prefer?

Seino: A heavier mouse feels more dependable. Perhaps that's simply habit.



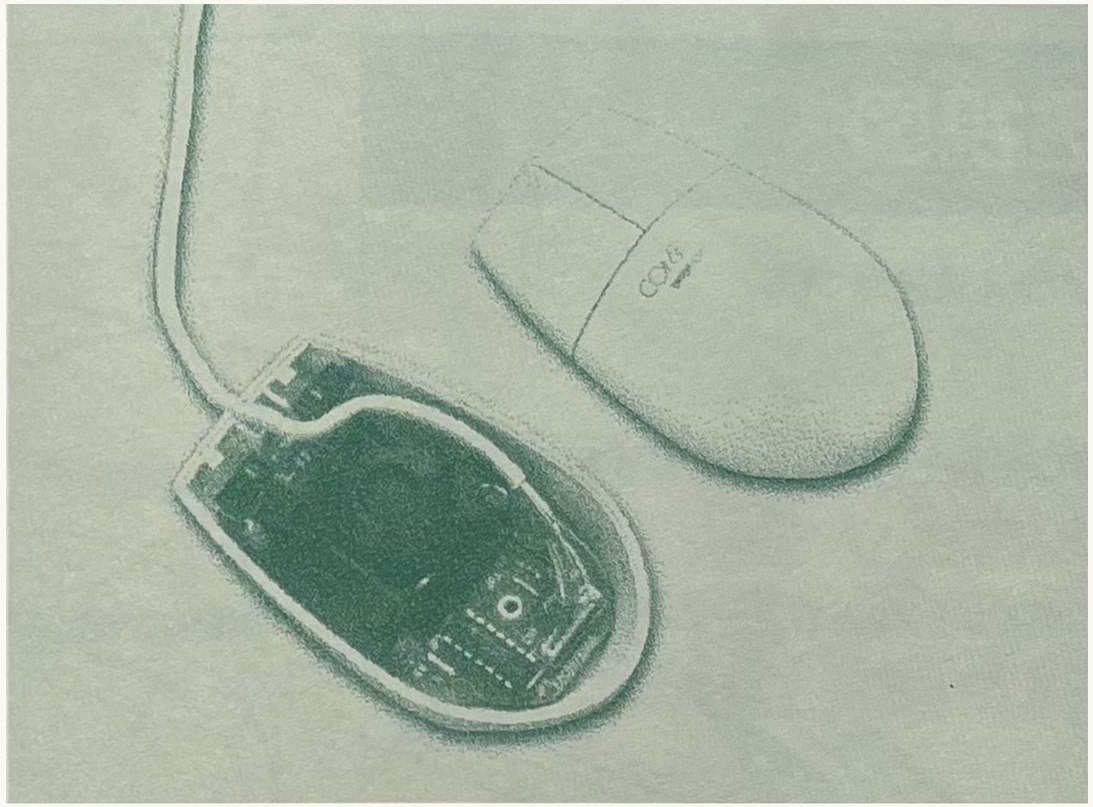
Tetsuhiro Seino

Inside the mouse

This chapter looks at what is inside a mouse.

Like the computer, a mouse can remain a "black box": you can move it over the desk without knowing how it works. But a mouse is much more mechanical than the computer itself, and its mechanism can still be understood simply by examining it.

Some may find it surprisingly complicated for such an intuitive action, others unexpectedly simple. Either way, this is what it took to help the computer grow beyond a calculating machine and become friendlier to its users.



Three parts of a mouse

A mouse can be divided into three main parts.

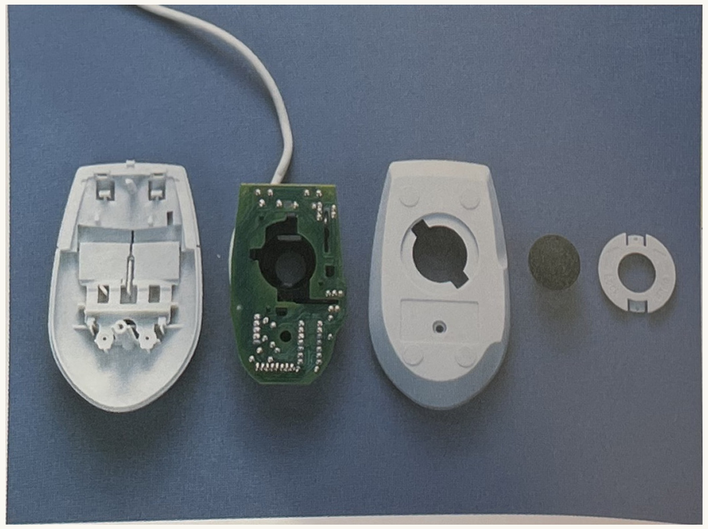
1. Tracking unit. Detects the mouse's movement as converted into rotation of the ball.

2. Button unit. Receives the user's clicks, double-clicks and other button actions.

3. Processor unit. Processes the tracking signals into data on the direction and speed of the ball's rotation, converts button signals into on/off pulses, and sends them to the computer.

One major difference in internal layout is whether the ball sits toward the front or the back.

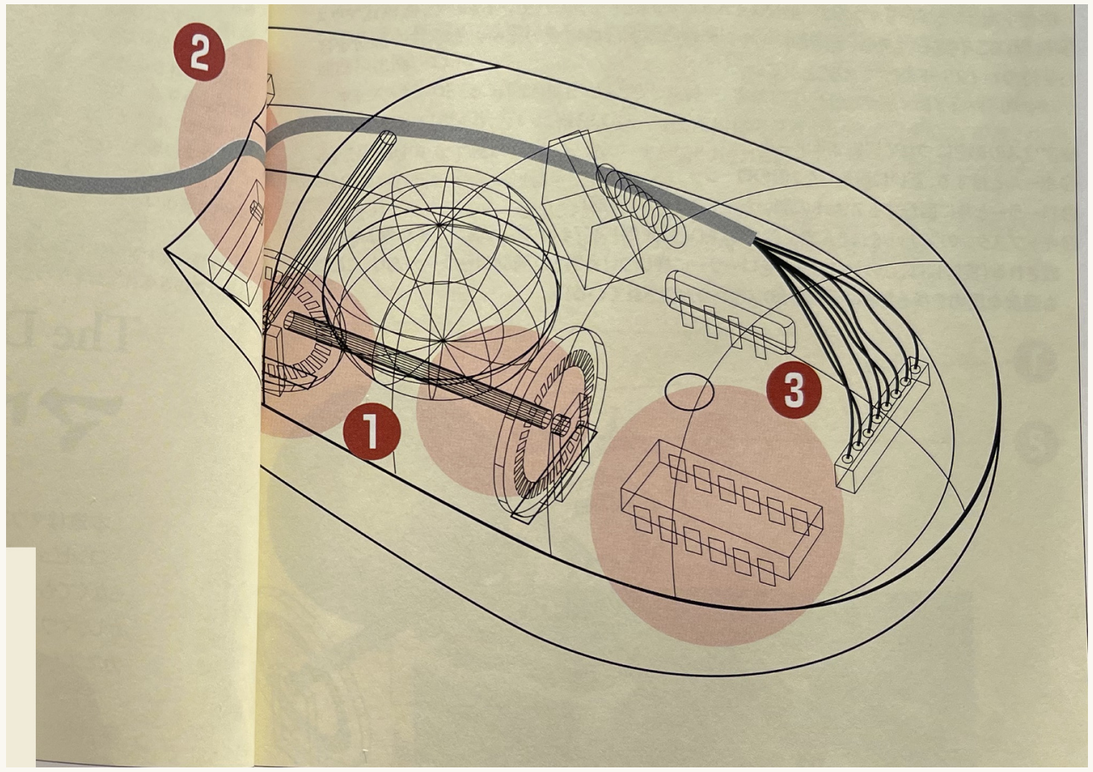
Remove the screws and the case comes apart easily. Inside are the circuit board, the ball and its retaining cover.



Case, circuit board, ball and bottom cover

The mouse at a glance

1. Motion-detection mechanism.
2. Buttons.
3. Processor.



How does the ball work?

The most common mice today are generally called mechanical mice. Their motion-detection mechanism, however, is often a hybrid of mechanical and optical components.

This hybrid mechanism consists of the following parts:

1. A ball that rotates as the mouse moves.

2. Two rollers, perpendicular to one another, in contact with the ball.

3. Slotted disks that rotate with the rollers.

4. LEDs, which emit light, and phototransistors, which receive it, placed on opposite sides of the slots in each disk.

There is actually a third, auxiliary roller: it presses the ball against the two main rollers. Choosing the correct pressure also calls for a certain amount of expertise.

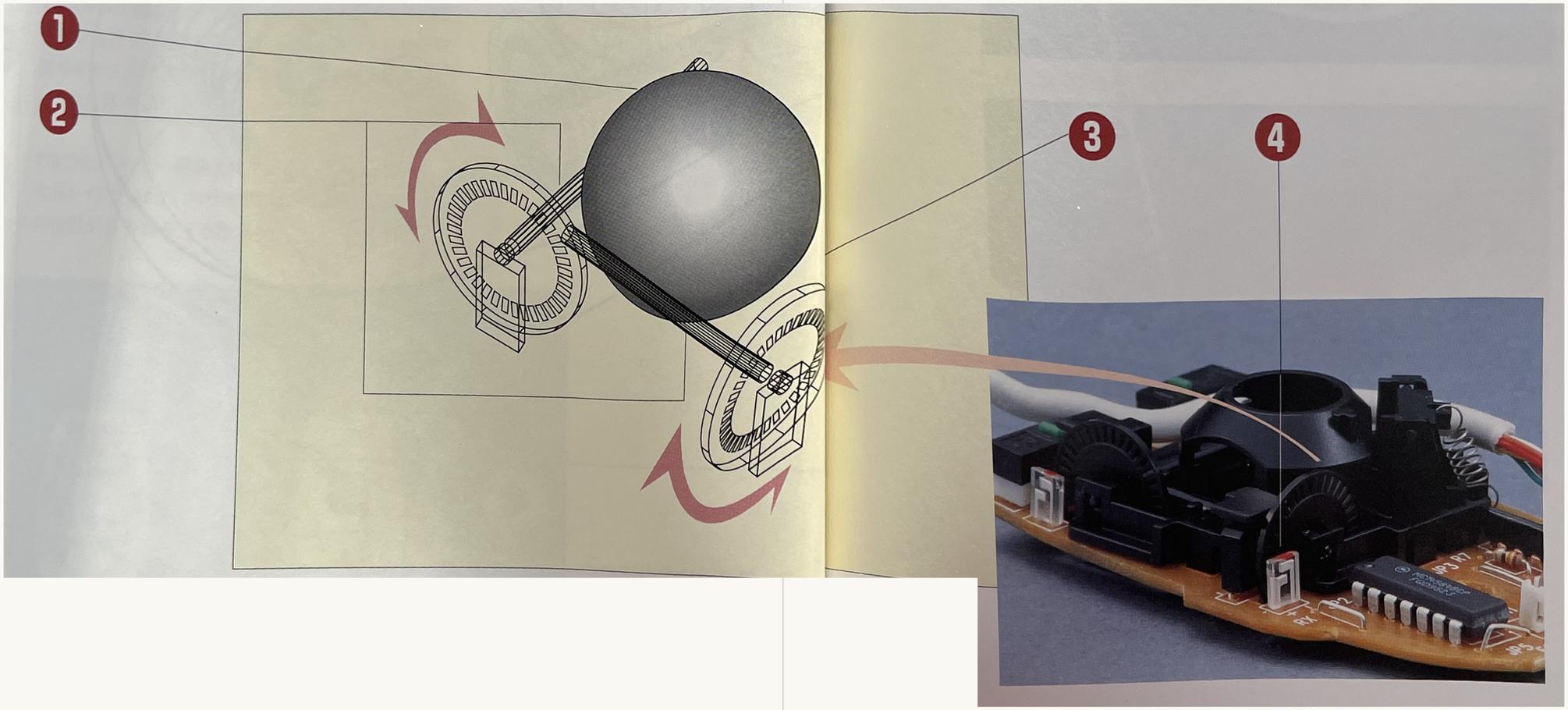
The mouse’s movement can be described by two quantities: direction and speed. To measure them, the rollers first separate the ball’s rotation into vertical and horizontal components.

Only two rollers are needed to follow movement in any direction because an appropriate amount of slippage is allowed between the ball and the rollers.

Each roller and its disk rotate in a 1:1 ratio. The disk’s slots periodically let light from the LED reach the phototransistor. The frequency of these pulses is directly proportional to the speed of the mouse along the corresponding axis.

Detecting the direction of rotation is slightly more complicated. Each disk has two LED–phototransistor pairs. They lie on opposite sides of the axis, but are slightly offset from positions exactly 180° apart. This small offset is crucial: the time difference between the two pairs’ signals reveals the disk’s direction of rotation.

The processor handles the direction and speed information from both disks in real time, then sends it to the computer through the mouse cable.



HISTORICAL INFORMATION AND PRICES RETAINED FROM THE ORIGINAL EDITION

How the buttons work

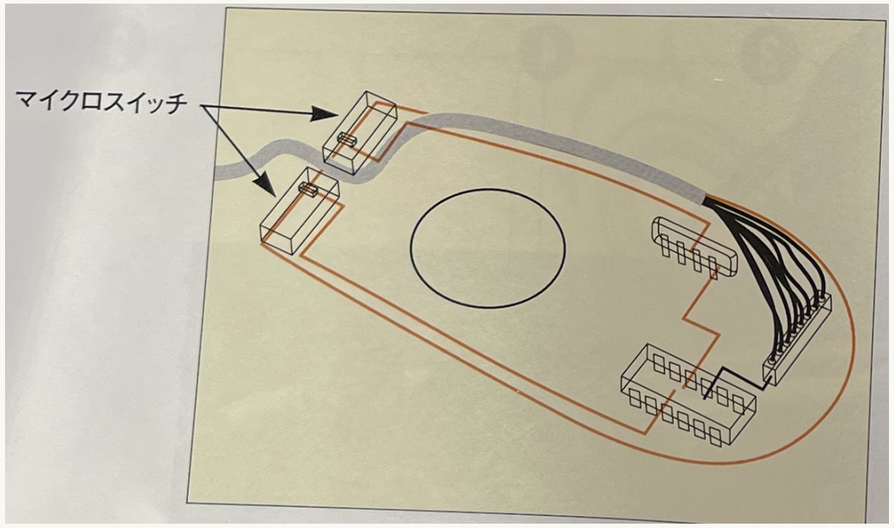
The button mechanism is simple, but it must withstand hundreds of presses a day.

Engelbart’s mouse used an ordinary exposed pushbutton switch, like a component on an instrument panel. The user had to hit its head precisely. That is inconvenient given today’s frequency of clicking and the differences in users’ hand sizes.

Modern mice therefore use a broad button forming part of the case, with a microswitch mounted on the circuit board beneath the corresponding plastic part.

Little dirt gets into this part, and it needs almost no maintenance. Eventually, however, the contacts and springs can suffer metal fatigue.

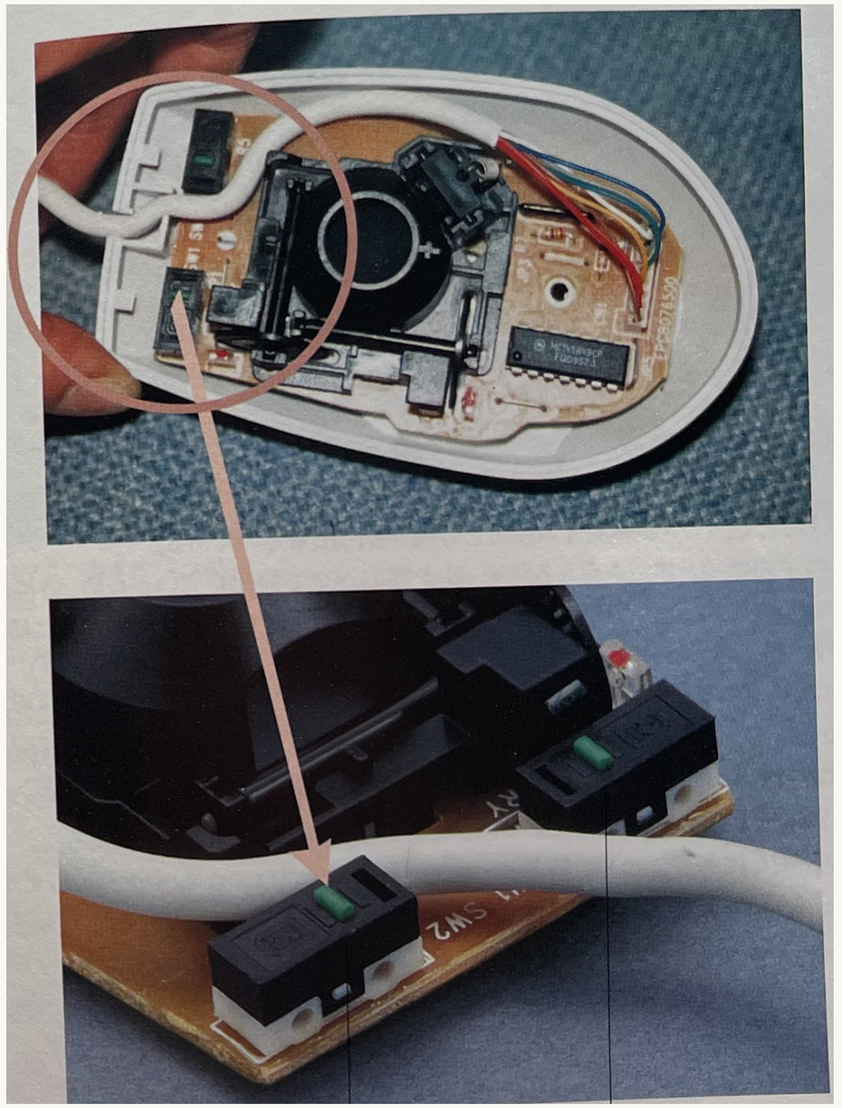
Usually the motion-detection mechanism wears out first and the mouse is replaced. A button failure, however, can be sudden, so owners of older mice should bear that in mind.



Microswitches: a two-button mouse has two.

Inside a mouse button

A microswitch detects the movement of the button.



The microswitch detects the button press.

How an optical mouse works

An optical mouse has no moving parts in its motion-detection mechanism. Its main elements are: 1—an LED; 2—a special pad printed with a grid; 3—a lens and mirror; and 4—a phototransistor.

The principle is simple: LED light reflects off the pad, passes through the collecting lens, reflects off the mirror and reaches the receiver on the circuit board. The frequency of changes in the grid's reflection and the sequence of light and dark areas reveal speed and direction.

Older designs detected horizontal and vertical lines with separate emitter–receiver pairs, using two LEDs and two phototransistors with different characteristics. New technology distinguishes both directions with a single LED, simplifying construction further.

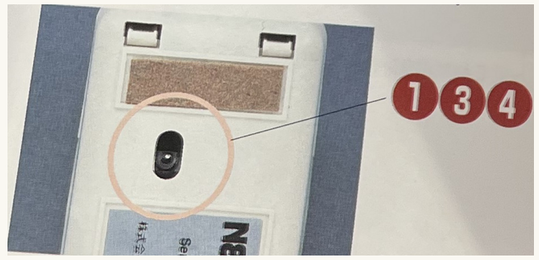
The mouse is light and needs no maintenance, although not everyone likes the way it feels. It also requires its own special pad.

A mechanical mouse measures movement relative to its own body, whereas an optical mouse measures it relative to the pad. It may continue to track when lifted slightly, which can make short movements controlled by the wrist awkward.

Optical mice nevertheless have devoted fans. Try one in a shop and see whether it suits you.



2. Special grid pad

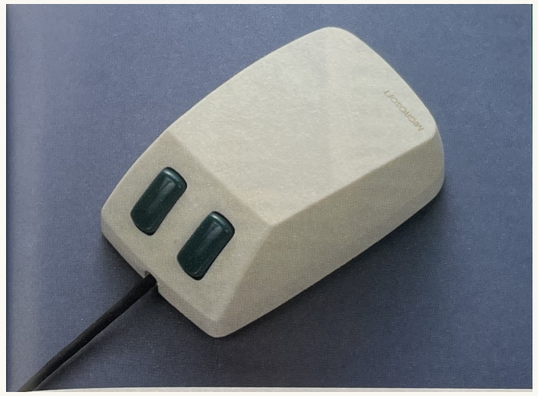


1. LED. 3. Lens and mirror. 4. Photodetector.

Developing the Japanese mouse

The history of the Japanese mouse began at Alps Electric. Shinya Tanaka joined the mouse evaluation team from the very beginning of development and knows its origins well. We spoke to this former Alps engineer, now at ASCII.

Shinya Tanaka, ASCII. Spent many years evaluating mice at Alps Electric. He now develops peripherals at ASCII.



Green-button Microsoft Mouse



Shinya Tanaka

Green buttons and a steel ball

Tanaka: The first mouse sold in Japan was Microsoft's green-button model in 1984. Alps Electric had made prototypes before that, though, and I was evaluating them at that stage.

The first Japanese mouse made by Alps shipped with a computer from the American company Tandy. The NEC PC-100 model used the same mechanism in a different case. It was called the Microsoft Mouse, although Alps Electric, Microsoft and ASCII developed it together.

Otani: So the Tandy mouse came first?

Tanaka: Yes. Microsoft's development was running in parallel, but Tandy went into production first. The Microsoft Mouse followed a few months later.

Otani: What was different about them?

Tanaka: Only the shape.

Otani: How did you decide on the number of buttons and the ball? Balls are usually rubber-coated now, but they were metal then.

Tanaka: Microsoft determined the entire exterior design.

Otani: Including the number of buttons?

Tanaka: Yes. Alps designed the mechanism inside.

A rough stainless-steel ball. We didn't have today's technology for coating a metal ball in rubber, so we used stainless steel. The surface was rough rather than smooth—a result of our tests.

The original balls were smooth, like ball bearings or pachinko balls. They slipped against the rollers, so the cursor didn't move. We roughened the surface, but had to decide how rough it should be. We asked the bearing factory to stop polishing at different stages, collected samples and selected the right one.

Otani: So you interrupted production and tested them, rather than sandblasting a finished surface?

Tanaka: Exactly. Later we learned to apply rubber: a small steel ball is held by pins while rubber is molded around it. That gave us the modern ball.

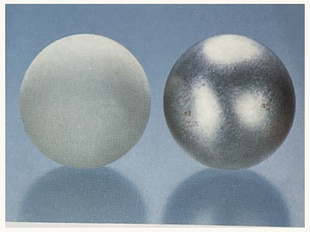
The switch to rubber.

Otani: It must be difficult to make the coating even and keep it spherical.

Tanaka: Yes. If the steel core is off-center, the mouse doesn't work properly: a line gradually drifts when you draw circles, for example. Eliminating that eccentricity was difficult.

Otani: So you wanted rubber from the start, but technical problems got in the way? It grips the desk better than steel.

Tanaka: The main issue was actually its grip on the rollers. There are two fixed rollers and a third, spring-loaded one at 45°. Their interaction also affects slipping on the desk. The ball has to be pressed against the rollers to measure movement, but the force needs very fine adjustment. Too much and the ball slides on the desk; too little and you can't draw a circle when you move quickly…



Mouse balls across generations

A 45° spring and expensive bearings

Tanaka: …Getting the pressure of that 45° roller right was very difficult at first.

Otani: A delicate adjustment indeed.

Tanaka: A rubber ball has more friction and makes the design much easier. Metal was difficult.

Otani: Sometimes a pad came with the mouse. I remember a thin vinyl surface. Was that because of the steel ball?

Tanaka: First-generation mice slipped on glass and other low-friction surfaces. We decided to limit the choice of working surface.

Expensive bearings.

Otani: Did Microsoft have any other special requirements?

Tanaka: Microsoft was responsible only for the exterior.

Otani: Alps designed the electronics?

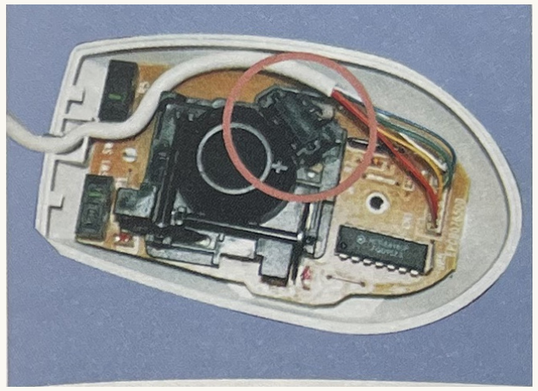
Tanaka: Yes. We made a sample, tried it, revised it, and repeated the process. A personal computer screen then had a resolution of 640 × 400 dots. The main task was to achieve reliable single-count movement over an A4-sized working area.

Otani: Old mice used bearings everywhere. Now there are Teflon pads on the bottom, or just molded projections on the simplest models. The old construction seems luxurious.

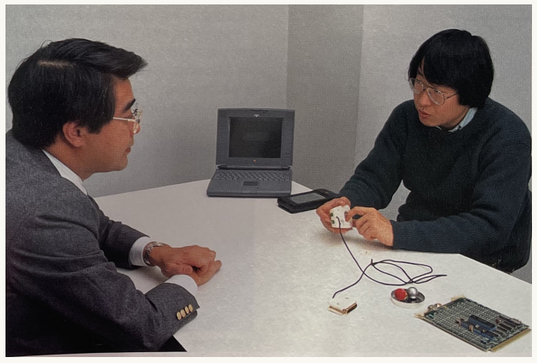
Tanaka: It was. Take an old roller apart and you'll find bearings at both ends. They were very expensive.

Otani: It would cost quite a bit to reproduce one now?

Tanaka: Yes. Today mice start at about ¥1,980, with most costing five to ten thousand yen…



The spring at 45°



During the interview

“And what is it for?”

Tanaka: …Back then a mouse cost ¥30,000. Before Alps developed the green-button model twelve years ago, the price could reach ¥100,000.

Otani: Those were workstation mice?

Tanaka: Yes. So even then we brought the price down to a third or a quarter. Today the construction looks lavish.

Otani: Did most Japanese users first encounter the mouse with the NEC PC-100?

Tanaka: Apple’s Lisa came before it, but in the personal computer industry it was still a novelty. We visited manufacturers to demonstrate it, moving the cursor and showing various operations. They watched and asked, “And what is it for?”

Otani: Did the demonstration program just move the cursor?

Tanaka: Yes, and you could do a little drawing. We explained selecting icons, as we do today, but people couldn’t picture working that way. Again they asked, “What would you do with it?”

Otani: They saw it as a limited input device for a particular program, rather than the basis of an entire environment?

Tanaka: The demonstrations probably made it look like a drawing tool. When the PC-100 arrived with menu selection, it became easier to explain. Before that, everything came back to “Why?”

Otani: Which mouse did you use as a reference during development?

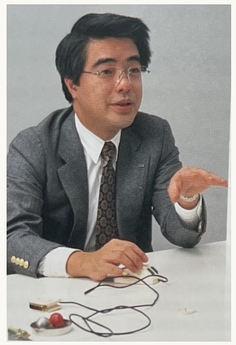
Tanaka: Before we started, there was the Xerox Star workstation mouse—perhaps the first mass-produced mouse in the world. Xerox held many patents on its mechanism. We had to avoid them while inventing new, cheaper solutions. It wasn’t easy.

Alps also filed more than sixty patent applications for its first mouse. I think they prevented other companies from making their own for a while, although the market was still small.

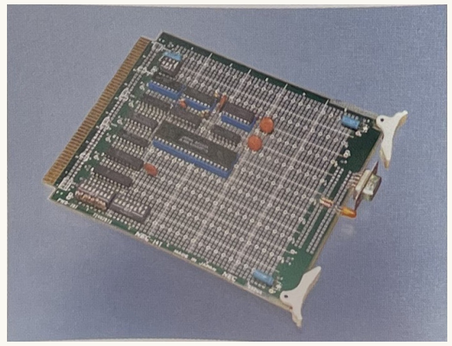
Connecting to the computer.

Tanaka: Even connecting a mouse was a major undertaking. You installed an interface board, wrote a driver and added support to the application. All the software had to be created—a real concentration of technical effort.

I worked in marketing and technical support…



Shinya Tanaka



Mouse interface board

Changes in design and production

Tanaka: …so I heard customers directly: “It’s heavy,” “The dirt is hard to clean out,” and other requests. We discussed improvements for the next version with the factory engineers. New models appeared about every two years, and prices kept falling, though not always by half.

At Alps, for instance, we rounded the rollers to reduce the buildup of stubborn dirt, and patented those changes. There were many ways to make a mouse, including optical designs, each with its own characteristics.

Otani: Why did Alps choose a ball and this particular mechanism?

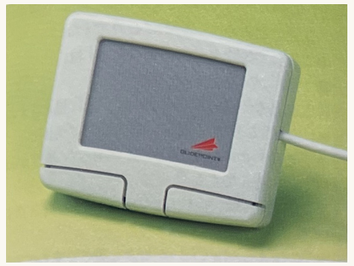
Tanaka: Alps was primarily a mechanical engineering company. The factory that first developed the mouse made volume controls for audio equipment. The encoder technology for those controls became our starting point. We wanted to build a peripheral using our own components. Another division might have produced a different mechanism.

Otani: So it began in a volume-control factory, yet most later mice developed along those same lines.

Tanaka: When I worked in marketing, Alps had 80–90% of the world mouse market. Today almost none are made in Japan. A few manufacturers besides Alps remain, but very few.

The largest mass producer now is Taiwan’s Logitech. Most mice are designed by Taiwanese companies and manufactured in Taiwan, Malaysia and China.

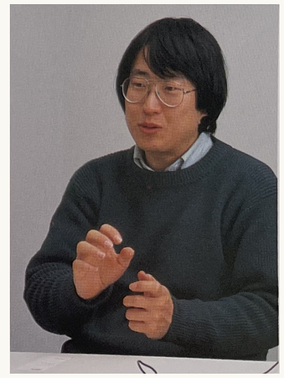
Today a mouse comes with the computer, and its price has fallen sharply. Low-cost manufacturing matters more than a company’s accumulated technical expertise. The same is happening with computers.



GlidePoint (trackpad)



Trackball



During the interview

The mouse is here to stay

Otani: What does the future hold for the mouse?

Tanaka: Given its success, it won’t disappear. Trackballs and GlidePoint arrived as replacements, but even many notebook owners buy a separate mouse.

Otani: They are all pointing devices, but they feel different to the user.

Tanaka: To me, devices like GlidePoint are less convenient than a trackball. But new notebooks are packed so tightly that there is no room for a trackball. Input devices have to become flat.

Otani: At least GlidePoint doesn’t need cleaning! I often use other people’s mice, and the first thing I do is clean them. The difference is immediate. It’s a pity the owner doesn’t maintain the mouse; work would be much more pleasant. The feel is so direct that it’s a shame when one dirty mouse makes the whole system seem difficult to use.

Tanaka: That’s why we need a cleaning kit.

Otani: Exactly! The bottom cover also seems a carefully engineered part: it must neither fall off easily nor be hard to open.

Tanaka: There are various fastening methods, and companies patent them.

Otani: What ball weight do you like? I prefer 18 grams.

Tanaka: About 22–24 grams, although 18 is fine too. An overly heavy ball has too much inertia and you can feel it rolling around; an overly light one feels unreliable.

Otani: The Macintosh, so closely associated with the mouse, also had lighter black balls. They didn’t exactly work badly, but I didn’t like the feel very much.

Tanaka: Logitech now uses relatively light balls. The pressure roller’s force varies between mice, so a ball that is too light sometimes won’t move the pointer at all. A heavier one doesn’t have that problem.



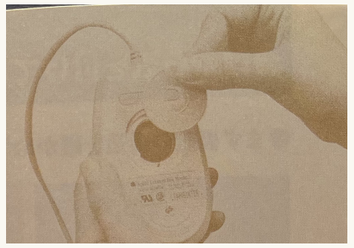
Shinya Tanaka

Using the kit

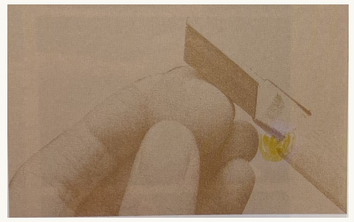
It is time to explain our kit in detail. We will also look at some distinctive mouse pads and accessories sold separately.

The mouse is your point of contact with cyberspace, as important as a car’s steering wheel. Some people like the sporting feel of a small wheel; others prefer the calm, smooth response of a larger one. Play should be eliminated, and sometimes it is worth replacing the wheel altogether.

There is still plenty you can do to make a mouse your own. I hope this chapter suggests at least a few possibilities.



Replacing the ball



Cleaning



Care accessories

Everyday care

First, get to know the bottom cover.

A new computer usually comes with a mouse. Or perhaps you are unpacking a new mouse to replace an old one. Before using it, examine the bottom cover and remove the ball at least once.

There may be a urethane or polystyrene insert that stops the ball turning in transit. Removing it is a good reason to open the cover, rather than simply pull the packing out.

Some drivers apparently never open their car’s hood. In practice, once you have done it, looking inside becomes easy.

A mouse is much simpler, of course. But if you see the inside when it is new, you will notice dirt later. Gently press the rollers with a finger and you will immediately appreciate the delicacy of the mechanism.

You will have to open the cover to change the ball anyway, so you might as well do both at once.

When turning over every mouse you encounter becomes your first instinct, consider yourself a true connoisseur!



1. Open the cover



2. Remove the ball



3. Replace the cover

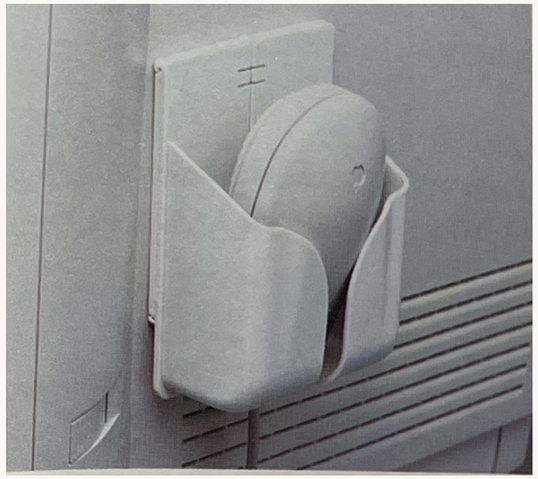
Avoid hard knocks

However sturdy a mouse looks, it is a precision mechanism. Naturally, it deserves careful handling.

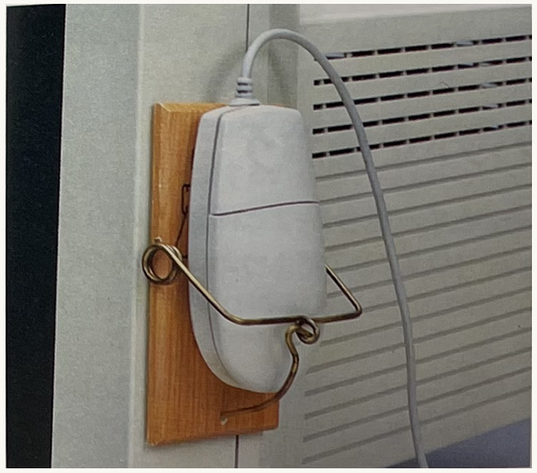
A fall, especially with a heavy ball inside, can break the roller supports. If the LEDs or phototransistors shift, accurate tracking is lost.

Don’t lift the mouse by its “tail,” leaving it dangling while you tidy up. As with ordinary appliances, strain at the cable entry can cause a poor connection or break a wire.

If your mouse lives at the very edge of the desk, clear a little space so it won’t fall. A special mouse pocket is another solution.



Mouse pocket



Mousetrap-shaped holder

Cleanliness and comfort

Clean a little, but often. Sometimes the first movement of someone else's mouse tells you how dirty it is inside. The owner doesn't notice the gradual daily change, but a visitor immediately feels the uneven rolling.

Even the owner may notice the pointer jerking or sticking horizontally and vertically, yet blame the computer or operating system. Others assume the mouse is worn out. How unfair to both mouse and computer!

Dirt builds up little by little, so regular cleaning is necessary. Some people grow to enjoy it, rather like cleaning their ears, and do it whenever they have a spare moment. That may seem excessive, but perhaps it is just the right attitude for comfortable GUI work. You can also clean a friend's dirty mouse, show them how, and tell them about our kit.

If your palms perspire, choose a cloth pad. Most dirt inside a mouse forms this way: skin oils on the working surface transfer to the ball, collect fine dust, and are compressed into a sticky deposit on the rollers.

Since we hold a mouse with our bare hands, this cannot be avoided completely. But it can be reduced. Experience shows that a surface which absorbs a little oil keeps the ball cleaner. On an unvarnished wooden desk, for example, the desk tends to get dirty rather than the ball.

A cloth pad is therefore especially suitable for people whose palms perspire. It is a little less durable, and the choice is limited, as we will see, but in this respect it is very practical.

On a hard pad, avoid pressing down hard on the mouse: daily friction wears its underside more quickly.



Cleaning the rollers



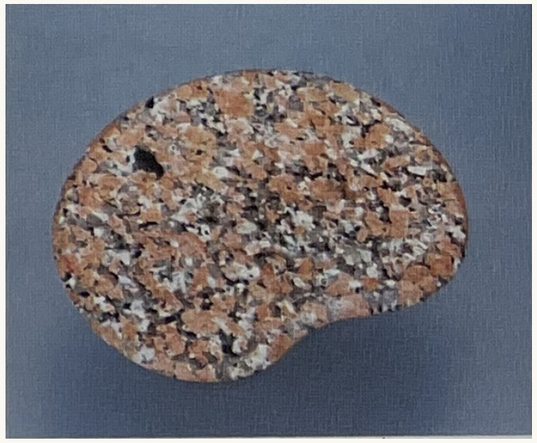
MacPower cloth pad

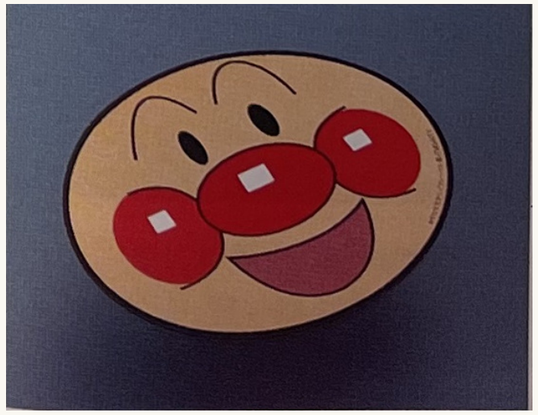
Choosing a mouse pad

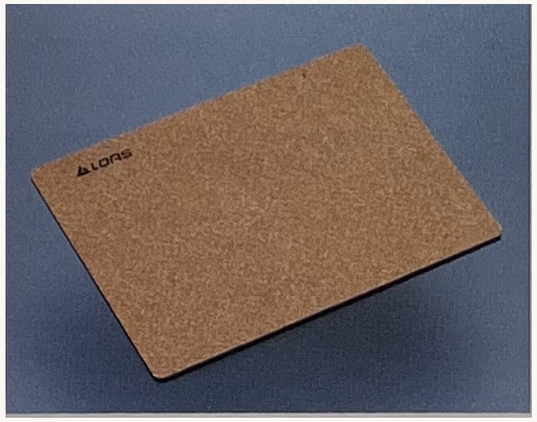
In my experience, if a desk has an ideal surface, you can use the mouse directly on it and very little dirt gets inside. Usually, though, the surface is uneven or dusty—especially in an office—and conditions are rather harsh for the mouse.

A pad helps. Many shapes and materials are available; the examples on the following pages should offer something for a wide range of needs.





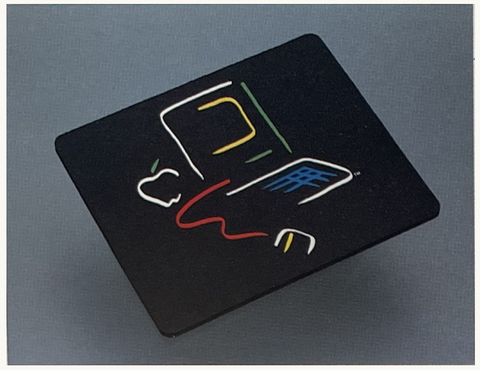




Choose by computer

Macintosh. If you belong to the “Mac religion,” the choice is obvious. The colorful, Matisse-like design has stayed the same since its introduction, yet still looks fresh. The material is plastic.

CF-002 · Collection · ¥2,500.



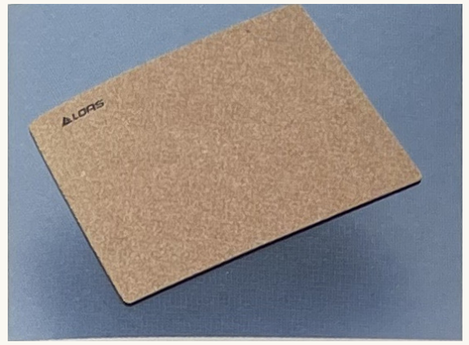


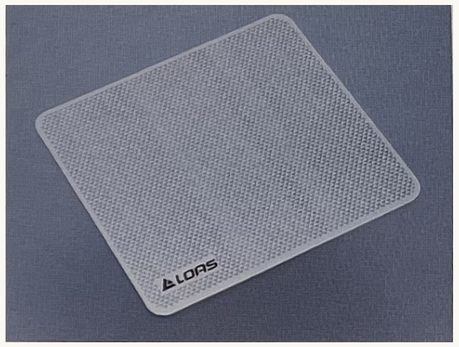
DOS/V. The familiar Windows window answers back. This pad is plastic too, but replaces the Mac pad’s elegant black background with pure white. Apparently the rivalry extends even to mouse pads!

MS0315 · Collection · ¥2,800.

Choose by material

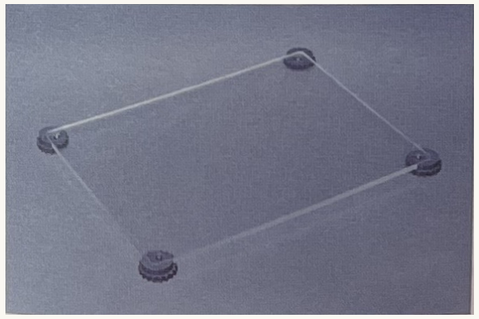
Cork. Warm cork goes well with wooden furnishings or a solid-wood desktop. It absorbs a moderate amount of moisture and perspiration; you could change pads with the seasons. MUP-501 · Loas · ¥1,180.

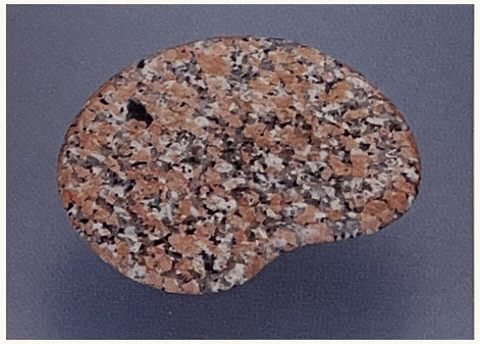




Aluminum. It absorbs no moisture, but gives the distinctive cool feel of metal. Wash the whole thing, wipe off the drops, and use it straight away. For lovers of cleanliness. MUP-503 · Loas · ¥2,800.

MECHA. This transparent acrylic pad is quite large. Ideal for slipping a favorite photograph underneath. MUP-201 · Loas · ¥2,800.





Granite. A cool pad for summer. Expensive, but unlike a computer, which will eventually need replacing, this luxurious object should last. It looks slippery, yet the mouse moves as though it grips the surface. CHEESE STONE · Sekishin · ¥6,000–7,500.

Character pads

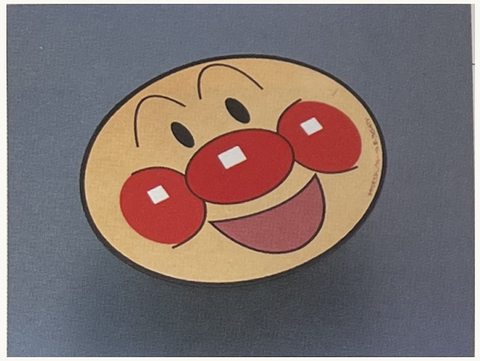
MacPower. A special pad produced by the magazine's editorial staff. It is said to ward off errors and "bombs"—or perhaps not. Collectors' items like this are rare, so get one if you have the chance. Cloth surface. ASCII · ¥2,000.





Snoopy. Many character pads are available, from familiar Snoopy and Disney figures to Ultraman. This one also has cloth over urethane foam, soft and pleasant to use. MP-002 · Elecom · ¥2,000.

Anpanman. An unusual oval pad. Thin and made of plastic, it is convenient for children because it stays fairly clean and is reasonably safe. TMS-065 · Collection · ¥1,300.



Unusual pads

Puzzle. The main advantage of this jigsaw-shaped pad is that it connects to a keyboard palm rest and other parts of the system. The usual combination of urethane and cloth. PMP-005 · Elecom · ¥700.





With a palm rest. A raised section supports the palm. Whether you need it depends on how you operate the mouse: watch your own movements first. Urethane and cloth. PMP-003 · Elecom · ¥800.

With a calculator. Why, when both Mac and Windows have software calculators? In practice, pressing these keys is faster than choosing a program from a menu. Urethane and cloth. J&P · commemorative giveaway.





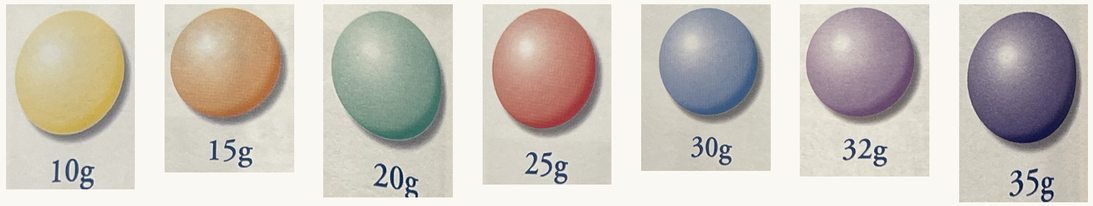
Color-changing. Heat from your hand turns this pad psychedelic, like a liquid-crystal thermometer. Just the thing for anyone who considers themselves an artist. Naturally, it feels like plastic. MP-005 · Elecom · ¥2,000.

Choosing a mouse ball

Seven balls come with this book. From lightest to heaviest, they weigh 10, 15, 20, 25, 30, 32 and 35 grams.

All are 22 mm in diameter, a common standard today. Some mice, especially older ones, use another size.

What if you are unlucky and they don’t fit? Look at it another way: perhaps your mouse is a rarity worth preserving!



Finding the right weight

The basic procedure is simple: 1—open the bottom cover and remove the original ball; 2—insert the balls from the kit in turn; 3—move the mouse forward, backward and sideways. If you don’t know how to remove the cover, see the next page.

You needn’t close it after each change. Differences in weight can be subtle, so quick changes help you feel them. You can even line up six balls on the desk and place the mouse, with its cover removed, over each in turn.

Once you have a rough preference: 4—close the cover with your chosen ball inside; 5—try some real applications. This also tests movements that involve lifting the mouse.

How often you lift it depends on the person and their experience. Some cover the distance with short strokes; others lift less often and make longer movements. This affects the best weight too.

Experienced computer users seem more likely to prefer heavier balls, perhaps because they are accustomed to older, heavier mice.

The lightest ball may slip on certain surfaces, so check that it works with your desk or pad.



Choosing the ball weight

Removing the bottom cover

To replace the ball or clean the rollers, remove the bottom cover. Here this means the ring that retains the ball, not the entire case.

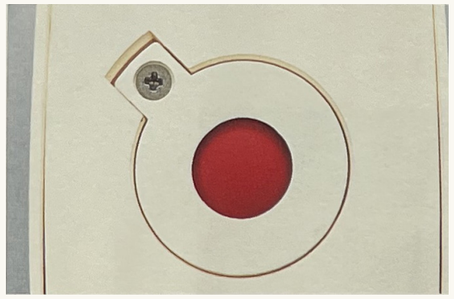
There are several fastening methods. Older covers used screws; today a twist-lock is more common, with sliding covers also found. The illustrations show sliding, screw-fastened, twist-lock and more elaborate versions.

On a twist-lock cover, the body usually marks the open and closed positions. Turn the ring about one eighth of a turn, usually to the left, to align its triangle with the open mark. If the ring is hard to lift, turn the mouse over: the ball's weight will push it out.

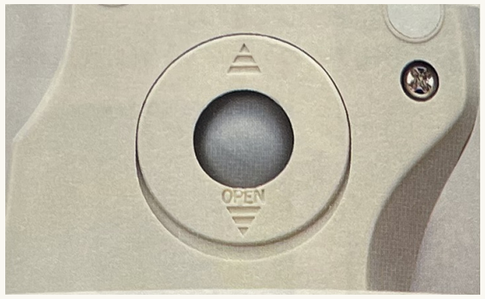
To close it, put the ring back and turn it one eighth of a turn in the opposite direction. The catches should click into place.

For a sliding cover, press and slide it in the direction of the triangle or arrow. The opposite edge rises; take hold of it and lift the cover off.

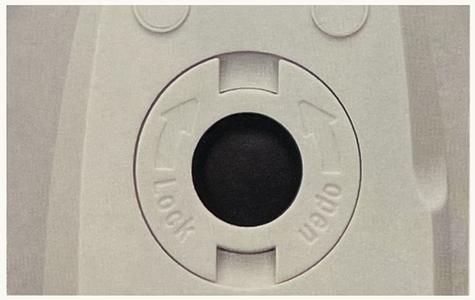
To replace it, orient it correctly and press the raised edge of the ring until it sits flush with the base. A click tells you it is secured.



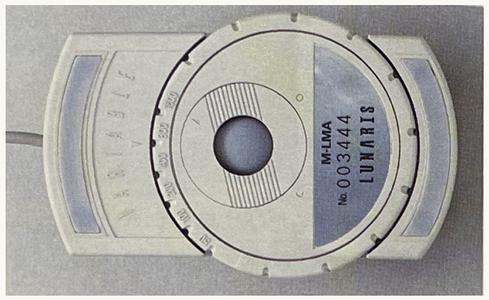
Screw-fastened



Sliding



Twist-lock



An elaborate mechanism

Cleaning the internal rollers

Poor mouse movement is almost always caused by dirty rollers. Uneven, sticky deposits can be felt with every movement. If too much accumulates, the ball has no room to turn and jams: the pointer either stays still or alternately moves and stops.

The rollers are the heart of a device resolving 260–400 counts per inch. Even a small amount of dirt can disrupt the pointer. Cleaning usually makes a noticeable difference even before performance has obviously deteriorated.

Using the brush supplied. There is a little trick to it. Open the cover, remove the ball and scrub the rollers as though brushing your teeth, but tilt the brush slightly against the direction of the stroke and press just enough to bend the bristles a little.

The bristle tips then catch the dirt and lift it off more effectively. Also check for hairs wound around the shafts and remove any you find. A small ordinary toothbrush will work too.



Brushing the rollers

When a brush is not enough

Cotton swabs. With regular care, a brush removes almost everything, from isolated sticky spots to dry, felt-like debris. But old deposits or mold-like stains may resist it.

Then use a cotton swab; you can make one by wrapping cotton around a match or toothpick. Moisten the tip with a little alcohol and rub the dirt. For stubborn deposits, wet them with alcohol first, let them soften briefly, then rub again.

The back of a knife blade. This is a rough method for experienced users. It can damage the roller or ball, so don’t try it unless you are confident.

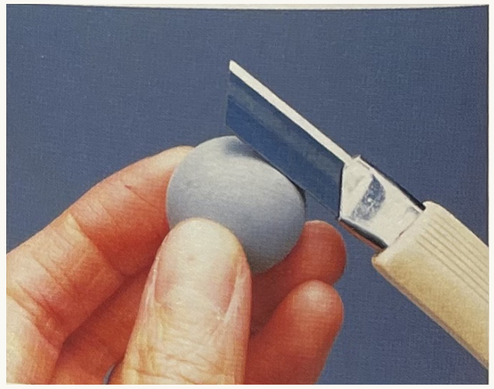
In a dusty office where many people share a mouse and nobody cleans it, the inside can be alarming. Imagine a roller covered in a thick ring of grime, like an Akita kiritampo rice cylinder. The grease has hardened into a rigid deposit.

The mouse stutters, but everyone somehow adapts. New employees who have never seen it clean may think that is how it is supposed to work.

In that situation, scraping with the blunt back of a utility-knife blade may be quicker. Again, angle it slightly against the direction of movement. Very experienced users cut almost through the dirt ring to the roller and remove it whole in a C shape. First, though, you have to find a mouse that neglected!



Cleaning the rollers



A technique for experienced users

The ball compartment and the ball

Cleaning the compartment. With practice, you can hold the mouse above you and clean upward, so debris falls out. Usually, however, we turn it upside down for easier access and better light.

Some debris then falls into the ball compartment, however careful you are. Finish by tapping the mouse gently on the desk, shaking out the crumbs and brushing the interior.

Cleaning the ball. Dirt is less obvious here than on the rollers, but the ball needs care too. If the mouse seems to slip after cleaning the rollers and the pointer behaves strangely, check the ball.

It is easy to clean: it comes out completely and tolerates water. The simplest method is a dry wipe. Wrap it in a towel or cloth and rub the surface as though kneading it. A microfiber lens cloth, such as Toraysee, also works.

If you have no cloth, use a tissue, taking care not to leave fibers. If that is insufficient, wipe with a damp cloth, then a dry one.

The last resort is to wash the entire ball in warm water with a little neutral detergent, rinse thoroughly under running water and dry it completely. Back in the mouse, it should feel like new.

Personally, I sometimes go straight to washing the ball: it is reliable and makes a pleasant break. “Tired of work? Wash your ball!” Could that become the mouse enthusiast’s motto? If even this fails, the mouse has probably reached the end of its life. Turn to the catalog on page 19 and choose your next main mouse.

Cleaning accessories

Commercial mouse-care products compete with our kit, but a few unusual and proven products deserve a look.

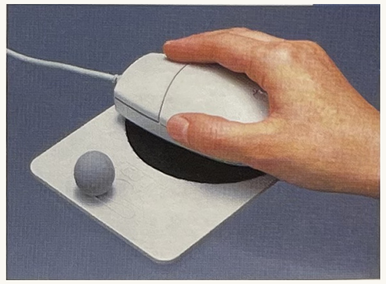
Cleaning products. A mouse gets even dirtier than a keyboard—that is the reason for our kit. Among ready-made products, the following are worth considering.

WIDEX. A classic cleaner. It is intended only for the exterior surfaces of mice, keyboards, computers and monitors; do not use it on internal parts, especially rollers. Available separately, but the kit with a low-lint antistatic cloth is more practical. CK-20 · Elecom · ¥1,600.



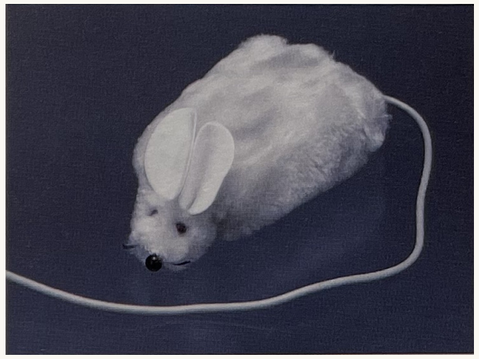
Clean Mouse. Replace the normal ball with one covered in a hook-and-loop-like material. Simply move the mouse over a pad using the same kind of fastening material, and it cleans the rollers. An unexpected idea! MC-1 · Sanwa Supply · ¥2,480.





Mouse covers

A little mouse cover. There is a practical benefit: the case stays cleaner. Mostly, though, it is a cute accessory. A little mouse is the traditional choice; recently, for some reason, chicken-shaped covers have also become popular. MC-01 · Elecom · ¥1,500.



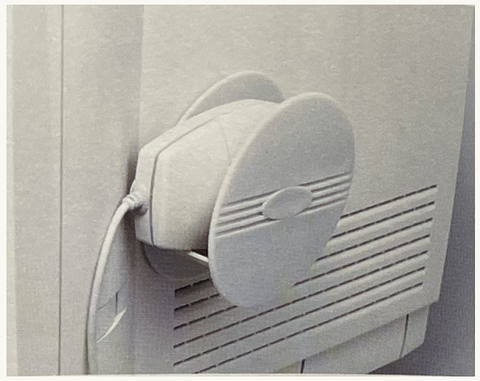


Wooden cover. Technically a cover, but once fitted it effectively becomes the mouse’s outer case. For some reason it costs more than an actual wooden mouse, but a failed mechanism is easy to replace. WoodMAC · ¥10,000–20,000.

Other useful accessories

The mouse gets lost among papers and is hard to find. A desk is used for more than computing, so you may want to put everything neatly away afterward. If that sounds familiar, buy a mouse pocket and give your mouse a home.

Round holder. Put the mouse in from the front or above without worrying about its position. An amusing detail: it says “Paroalto” rather than the correct “Palo Alto.” PMH-002 · Elecom · ¥500.



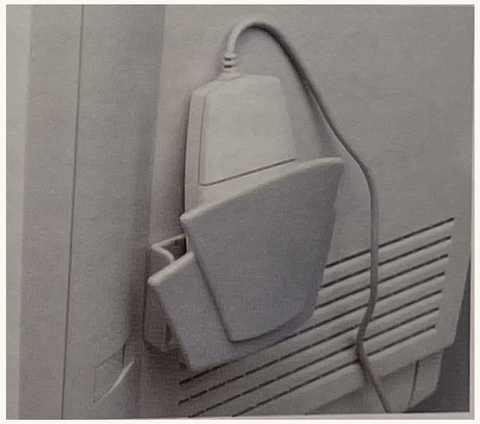
With a pen compartment. Pens and mouse can only be inserted from above, but the holder itself can be mounted at an angle toward you. PMH-003 · Elecom · ¥550.



Mouse holders

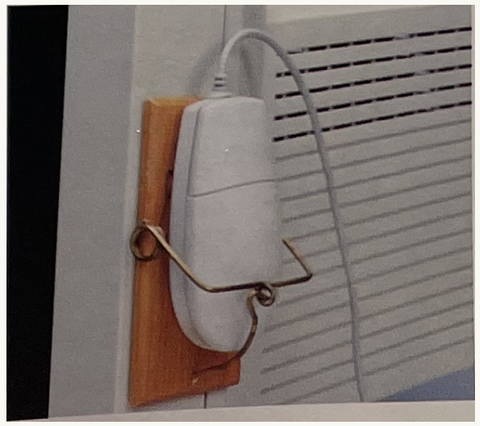
Cable pointing down. A slot accommodates the cable, allowing the mouse to be stored tail-down. The neatest option for lovers of order. PMH-004 · Elecom · ¥550.





With a side slot. The body resembles overlapping leaves. A cable slot in the side and other intricate details make it an excellent starting point for anyone who wants to paint their own holder. MUA-005 · Loas · ¥550.

Mousetrap. Less a pocket than a faithful reproduction of a mousetrap. For the full effect, dress the mouse in the cover shown earlier. Sold in the United States.



The future of the mouse

So what comes next for the mouse?

As long as its size is determined by the human hand, the case cannot shrink radically. A mechanical mouse needs a ball with a certain weight, so extreme lightness is unlikely too. But greater durability and better protection against internal dirt are sure to follow.

As mentioned earlier, possible general-purpose alternatives—trackballs, miniature joysticks and touchpads—are increasingly built into notebooks. Games and home information devices use controllers with integrated trackballs and joysticks, while handheld information tools commonly combine a touchscreen and stylus.

Each choice, however, serves the special functions of a particular device. For a general-purpose desktop computer, the mouse’s superiority is unlikely to be challenged in the foreseeable future.

Even notebook owners often connect a mouse at a home or office desk. Few devices match it for design and page-layout work. The usual approach is to make it the primary device and supplement it when needed with capabilities it lacks, such as a pressure-sensitive tablet.

Even if practical voice and gesture recognition soon handles ordinary users’ everyday tasks, our lovable mouse is unlikely to disappear completely. It will remain an auxiliary pointing device.

Acknowledgments and contacts

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Contacts for mice, pads, holders and cleaning kits. These are the historical telephone numbers printed in the book.

Art Arts — 03-3267-1562

Elecom — 03-5950-4131

Collection — 03-3252-5110

Sanwa Supply — 086-223-3311

Sekishin — 0296-20-6111

Minolta — 03-5423-7555

Logitech Pacific — 03-3578-8688

Tech Parts — 03-5688-1937

Nihon Electronics — 03-5474-4181

Loas — 0723-61-9271

WoodMAC — 03-5247-2979

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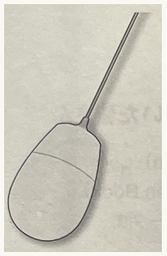
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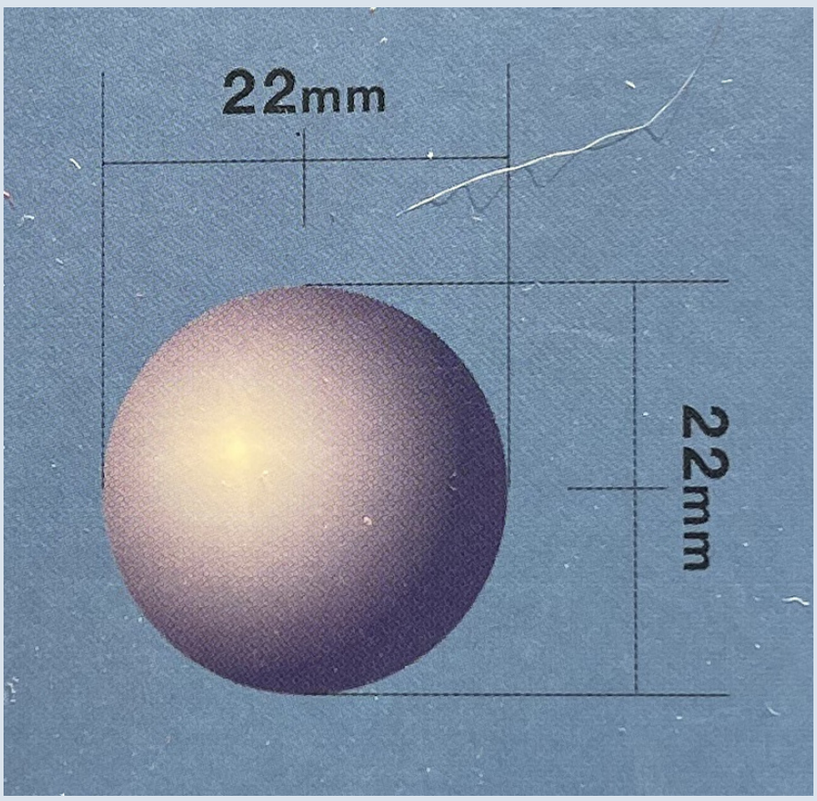
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Ball diameter: 22 mm

Mouse Balls · Rainbow

Kazutoshi Otani

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