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Discovering Japan
2013 no. 10

Special Feature

Quality with a Japanese Flair

For Safety and Peace of Mind

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no.10

contents

Above: N700A series Tokaido Shinkansen train speeding past Mount Fuji. (See page 9. Photo courtesy of Central Japan Railway Company.)

Cover: East Japan Railway Company conductress doing a visual check for safety purposes on the Akita Shinkansen Line. (Photo by Watanabe Shigeki)

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Special Feature

Quality with a Japanese Flair

For Safety and Peace of Mind

Manufacturing, distribution, food production, the retail industry, medical treatment... In all sectors, Japan's flair for quality promotes safety and peace of mind through continual improvements in technologies and services.

In Pursuit of Safety

Japan has long valued and fostered safety and peace of mind.
Murakami Yoichiro explains how this has been manifested in both mindset and practice.
He was the first scholar to propose the value of safety science,
which is the study of frameworks for a safe society.

Photos by Natori Kazuhisa

Left: Train driver performing a point and call check to add another layer of safety to train operations. Point and call checks are an excellent example of Japan's high commitment to safety. (Photo courtesy of Niigata Nippo Newspaper)
Right: Factory workers search out even the smallest imperfections, and this mentality is behind improvements in manufacturing technology. (Photo courtesy of Aflo Co., Ltd.)

A value system that takes safety for granted

I've been a proponent of safety science since around the end of the 1990s, and I've exchanged views with a wide spectrum of business managers as part of my studies. They all say they're well aware that safety is a key corporate responsibility, but many told me they don't see the need to play up the word "safety" as part of their company image.

I suppose that's because we Japanese tend to take safety for granted—it is a key part of our value system. We consider it to be an obvious necessity in our lives. But when something is taken for granted, it doesn't necessarily stand out as a point of appeal, nor does it convey a message that grabs people's attention.

Murakami Yoichiro

Zeal and diligence for what we take for granted

Just because safety doesn't inspire catchphrases that motivate consumers doesn't mean companies ignore its importance. On the contrary: companies know if they don't maintain safety they will perish. This is the starting point of how we look at safety, and this awareness is well accepted in Japan. Any examination of the country's corporate mentality finds that the need for safety is so well understood that companies seem practically obsessed with it.

For example, one often sees train drivers and sometimes even conductors point a finger at track signals, directional indicators and other things they have to be aware of, and then call out audibly to themselves that they've done the check. These "point and call checks" might at first seem unnecessary to an outside observer, but they raise safety to a much higher level than if they are not performed. Point and call checks reduce the risk of being negligent, or absentminded, or forgetting to ensure everything is safe.

Safety consciousness leads to safety for the employee, too, and insisting on audible point and call checks demonstrates that the commitment to safety has truly permeated the whole company.

High-speed rail transport: Standing strong in the face of earthquakes

Japanese technology has achieved a level of safety performance that is exceptional by world standards. This is probably best illustrated by the fact that, ever since it opened in 1964, the Shinkansen high-speed rail system has never had a fatal on-board accident involving passengers. The Great East Japan Earthquake of 2011 caused serious damage, but Shinkansen trains stopped quickly when the seismic activity first started, completely preventing fatalities.

The Great Hanshin Awaji Earthquake of 1995 occurred in the early morning before the trains were running, so there were no fatalities or injuries on the Shinkansen system. But the system did suffer severe damage in the affected area and several sections of elevated track collapsed there. This lesson led to reinforcements for elevated Shinkansen track, which experienced no destruction from the 2011 seismic activity. Advanced devices also played a major role during the earthquake's preliminary tremors, stopping trains before the severe vibrations. Incidentally, this success didn't cause the railway to remain satisfied with the status quo—it still keeps sharpening its technologies in pursuit of even greater safety.

Attention to details and flexibility: Two keys to safety

The motive of companies going the extra mile for safety is not just that the public demands safety and peace of mind. There's another factor as well—they want to keep raising their technological potential, and this happens to result in greater safety.

Behind Japan's world-class technical expertise is the zeal of engineers aiming to raise their personal technical skills. Meanwhile, factory workers have a mindset committed to finding even the smallest imperfections. For individual companies, their strength lies not only in the talents of their engineers but also in how their staff members work as a united team to ensure that the hard work of engineers helps to achieve overall company goals.

Rather than remain content with conventional technology, the Japanese exhibit flexibility in adopting the latest techniques. One good example is medical devices such as CT scanners (which use X-rays to take computerized cross-sectional images of the body). Japan has more CT scanners in operation than any other country, and it has taken the lead with heavy particle beam therapy to treat cancer. A predisposition for attention to detail and the right amount of adaptability result in safety levels unparalleled in the world.

Japan's responsibility after the nuclear accident

Over the centuries Japan has been struck by countless earthquakes, volcanic eruptions and other natural disasters, while economic growth has been accompanied by many pollution incidents, especially early on. Each of these has served as a lesson and promoted a propensity to develop measures to protect ourselves from future crises. Although this can seem excessive, the good side is that our high level of safety reflects the people's concerns. The corporate pursuit of technical expertise and the people's call for safety—this combination is driving the development of technology that meets high safety standards.

Despite this, in 2011 Japan underwent the bitter experience of the earthquake and tsunami that triggered the Fukushima Daiichi Nuclear Power Station accident, forcing the country to go back to the basics in its pursuit of safety. The nuclear accident caused the emission of large quantities of radioactive materials, something that should never happen.

It would be a massive undertaking to decommission all of the country's nuclear power plants, taking dozens of years, or even 100 under some scenarios. Even if we were to finally get rid of them all, there will still be a need to prevent the occurrence of such an accident elsewhere, while passing on to others the technologies needed to manage nuclear energy as part of the decommissioning process. Surely this means that Japan, having operated nuclear power plants for half a century, and having thrived thanks to their energy, has this responsibility to the world.

Murakami Yoichiro
Specializing in the history and philosophy of science, Murakami is President of Toyo Eiwa University and honorary professor at the University of Tokyo. He is well known for his many years of research into the relationship between science and society. He has been a proponent of the study of safety (safety science) since the 1990s, examining ways to deal with safety issues not only as a matter of science and technology but also from the perspective of the relationship between people and society.

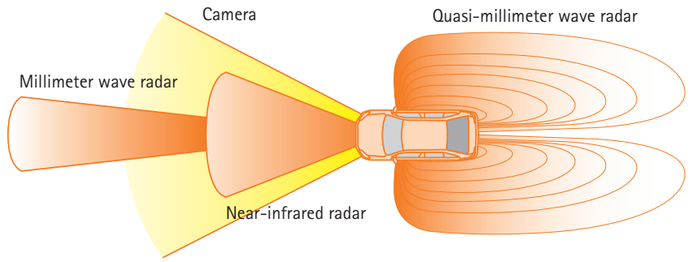
Japanese Cars on the Road to Higher Safety Standards

A comfortable ride, infrequent repairs, safe, good on gas... no wonder Japanese cars attract praise worldwide. Drivers trust them because of the manufacturing expertise of the Japanese, who always pursue perfection even in the details. Especially over the last few years, the nation's car manufacturers have been developing technologies that raise automotive safety standards even higher. Here are some pioneering safety systems using advanced technology for Japanese cars.

Illustrations by Kato Aiichi and Oguro Kenji

1 Helping drivers avoid collisions

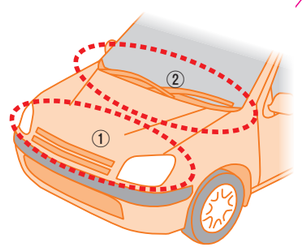
Collision avoidance technologies use detection devices such as radar and cameras to monitor conditions in front of the car and behind it, and automatically control speed. Collision avoidance brakes warn you of the risk of a collision and apply braking force automatically. The radar cruise control system detects the speed of the car ahead and your following distance, to help you keep a safe distance behind. And the acceleration control system helps you avoid a sudden fast start if you press the accelerator pedal by mistake.



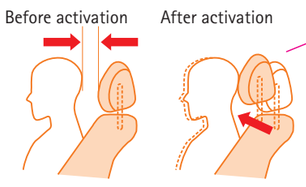
Detection system to reduce the risk of a collision. Cameras and radar systems watch out for a possible front or rear collision.

2 What if a collision cannot be avoided?

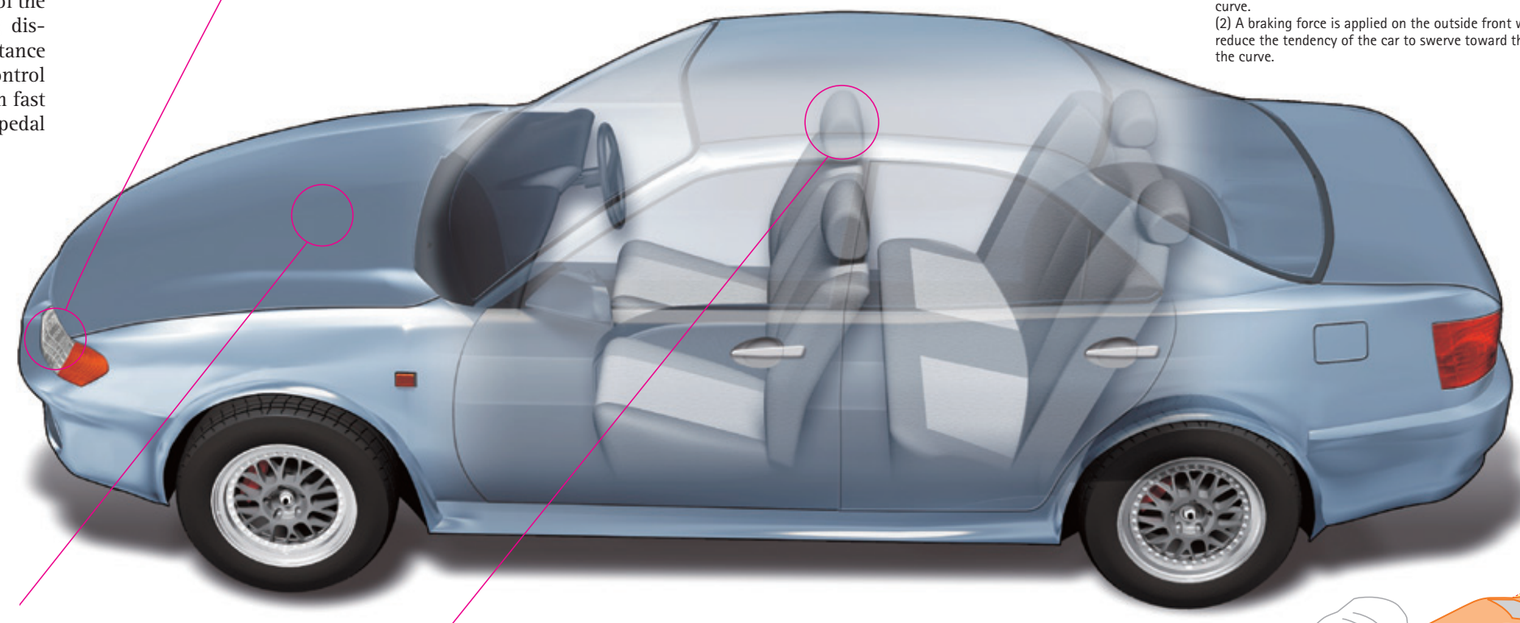
New technologies also aim to reduce injuries to pedestrians and car occupants if a collision occurs. Pedestrian injury can be reduced with a front bumper and hood that crumple to absorb the shock of a collision and diminish the force hitting a pedestrian. The rear pre-crash safety system detects an oncoming collision from behind, activates the back lights to issue a warning, and shifts the occupants' headrests forward to help lessen the collision impact.



Example of a car body structure designed to reduce pedestrian injuries in collisions:
(1) The bumper and front part of the hood crumple to reduce injuries, especially to children.
(2) The rear part of the hood and wiper bar area crumple to reduce injuries, especially to adults.

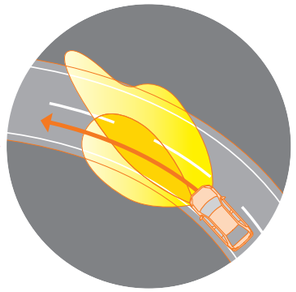


When the rear pre-crash safety system detects an oncoming collision from the rear, it shifts the occupants' headrests forward to help lessen the impact to the neck.

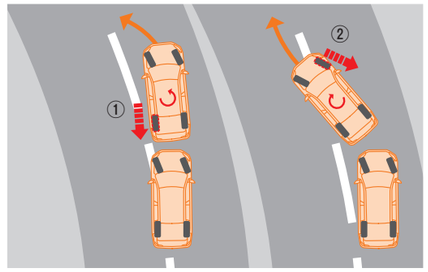


3 Pursuing precision on the road

Other technologies support and maintain safe driving. The lane departure warning system warns the driver of an unintentional lane change, and supports steering operations. The lateral slip prevention system monitors the movement of the four wheels and applies optimum brake pressure to prevent the car wheels from slipping sideways on curves. The adaptive front-lighting system (AFS) moves the headlights in accordance with steering input and vehicle speed, improving illumination in the direction of travel.



The adaptive front-lighting system (AFS) moves the headlights to provide better illumination to the inside curve and help the driver check for obstacles at night.



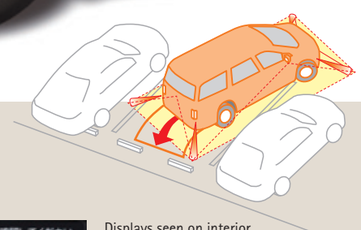
How the lateral slip prevention system works:
(1) A braking force is applied on the inside rear wheel, to reduce the tendency of the car to swerve to the outside of the curve.
(2) A braking force is applied on the outside front wheel, to reduce the tendency of the car to swerve toward the inside of the curve.

Parking made easy

The Around View Monitor

The Around View Monitor system uses four cameras—one on each of the side mirrors, one at the front of the car, and one at the rear. The system processes video from those four cameras to display the car's position as if you were seeing it from above. This eliminates blind spots and makes parallel parking and backing into a parking space easy. The system also gives a warning when it detects something moving near the car.

Displays seen on interior monitor. Parking is easy because the driver uses the monitor to verify car position and orientation. (Photo courtesy of Nissan Motor Co., Ltd.)



Central Japan Railway Company's Shinkansen General Control Center controls operations on the Tokaido Shinkansen Line.

The "brain" behind train operations: The Shinkansen General Control Center

The "brain" keeping Tokaido Shinkansen trains running safe and on time is the Shinkansen General Control Center. A large room there has an immense board extending across an entire wall, showing tracks, stations, and real-time information on train locations at a glance. If it looks like a train might be delayed, controllers may adjust scheduling to let trains behind it move ahead. In heavy rains or strong winds, a command might go out to stop trains at a moment's notice, limiting delays elsewhere and preventing accidents. With the help of controllers' alert eyes and input, the control system is second to none, as the Shinkansen's strong safety record shows.

"Dr. Yellow" checks the condition of the track and overhead power supply wires.

"Dr. Yellow"—Diagnosing conditions on the go

Nicknamed "Dr. Yellow," the Shinkansen Electric and Track Inspection Train is a reliable diagnosis tool for the high-speed rail system. It makes "doctor's" rounds between Tokyo and Hakata about once every 10 days, checking the condition of the overhead power lines and track. On-board sensors diagnose the condition of equipment, and any maintenance needs are addressed promptly. People rarely see the train, so many who catch sight of it consider it a sign of good luck. Some people even call it "The Good Luck Train."

N700A series trains: New technology for fast, safe stops

Japan's latest high-speed train is the N700A. It entered service on the Tokaido Shinkansen Line in February 2013, and on the Sanyo Shinkansen Line the following month. It is equipped with a newly developed earthquake-triggered braking system that permits even shorter stopping distances when a quake is detected. The N700A also has a system that continually monitors vibrations experienced by the wheel systems supporting the railcar and quickly detects even minor abnormalities.

Central Japan Railway Company's newest train, the N700A, on a Tokaido Shinkansen track. It is equipped with a system that stops trains quickly in emergencies to avoid accidents.

Shinkansen High-speed Trains Run Safe

Shinkansen super express trains connect major cities throughout Japan, traveling at astounding speeds while keeping to the schedule remarkably well. Equally surprising is their safety—for example, during 48 years of continued operations since Tokaido Shinkansen trains began running in 1964, the system has never experienced an accident causing an on-board passenger fatality. These pages look at just a few of the technologies, systems and people involved. Also revealed here are some of the secrets of Shinkansen safety as it speeds into the future.

Photos by Watanabe Shigeki

Left: East Japan Railway Company staff work without a wasted movement, cleaning and tidying a passenger car interior. It takes them just seven minutes.
Right: Their job done, they give a low welcoming bow to passengers about to get on the train.

7-minute magic: Marvelous interior cleaning

Shinkansen trains are well known for their clean and tidy interiors. Tokyo Station, the busiest station in Japan's high-speed rail network, is the departure point for the Tohoku and Joetsu Shinkansen lines. Trains on these lines slide in and out every four minutes or so, using four platforms. They remain there for 12 minutes, five of which are for passengers to get on and off. That leaves just seven minutes for station staff to change the seatback covers, collect and remove garbage, sweep floors and more, coordinating their teamwork under a leader. The workers bow to arriving and departing passengers; these scenes of hospitality on Shinkansen platforms have become legendary.

First they protect the walls, stairs and floors from scrapes.

Suits are placed in special holding cases to prevent wrinkles. Large pieces of furniture are dusted and then covered with protective wrapping, and dishes and utensils are wrapped in shock-absorbing material.

Japan's Delivery Services Really Have a Heart

Fast and reliable. Delivery companies know what the customer wants, and they follow through with good will and attention to detail. Japan's distribution services move things, of course, and they bring a lot of sincerity along, too.

Photos courtesy of Art Corporation and Yamato Transport Co., Ltd.

One company in Japan delivers about 1.5 billion items a year, sorting them by machine and hand.

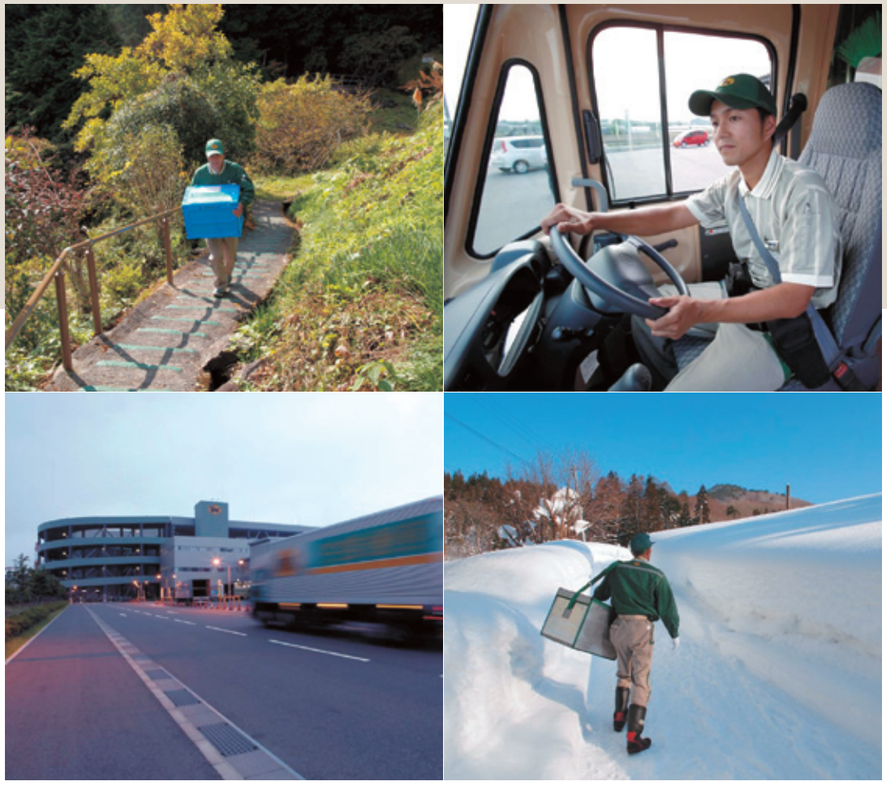
Household effects are transported and delivered carefully and promptly. The walls and floors at the new residence are also protected from scrapes, of course.

Sit back and leave it to these moving services

Movers in Japan bring sincerity to your door and pay attention to detail. They come before the move to give you an estimate, and after the move they compensate you if anything gets broken. Their paramount service is the "Leave It To Us" package, inspired by the customer's "If only they..." wish list. Just like the slogan says, you can leave it all to them. They will dust things before they pack, cover your furniture and household goods in wrapping to protect them from damage, safeguard your dinnerware with shock-absorbing material, place your suits in special holding cases, transport everything, then unpack it all and arrange it neatly in your new home. They may very well be more careful with your personal things than you would ever be. Your role is simply to relax and, yes, leave it to them.

"Your move is finished, ma'am!" The company recycles cardboard boxes used for the move—no need for you to put them out with the garbage.

Long-distance delivery services use expressways and railways late at night throughout the country. On snowed-in roads and mountain paths, drivers deliver packages by hand.



Dependable express parcel deliveries—From anywhere to anywhere in Japan

Home delivery services take your package safely to its destination during the promised time slot, anywhere in Japan. The attraction of small cargo trucking lies in pickups and deliveries carefully designed to ensure user convenience.

Delivery times are a promise—the delivery day of course, but also the time slot. There are six every day to choose from, beginning in the morning until 9:00pm. Just one of the many advantages is refrigerated or frozen deliveries for fresh vegetables, seafood and meat. Some delivery companies partner with convenience stores to offer 24-hour pickups.

These services are possible thanks to the companies' delivery networks. After pickup, your package goes to one of the many logistics centers located all over the country, and from there to drivers who go door to door, making into-your-hand drop-offs during the promised time slot. If the truck cannot enter a residential district, delivery staff will use a bicycle trailer or pushcart, and in mountainous areas and heavy snows where no vehicles can travel, packages go on foot and are delivered by hand.

Safe and dependable. Every day, trusty home delivery trucks are making their rounds, all over Japan.

Convenience Stores

Practically Everywhere, Always Handy, and Safety Conscious, Too

They offer a great range of goods and services, give consumers peace of mind, and promote safety. Yes, convenience stores in Japan do all that and more, and they now act as vital community hubs, as well.

From a conversation with Kato Naomi
Photos by Enomoto Yoshitsugu
Photos courtesy of the Japan Franchise Association and Lawson, Inc.

Kato Naomi
A consumer lifestyle consultant, Kato draws on her vast knowledge of the distribution industry as a frequent contributor to magazines specializing in marketing and distribution, and is the author of *Konbini* to *Nihonjin* ("Convenience Stores and the Japanese").

Kids playing without a care in the world in front of a convenience store that serves as a shelter in an emergency.

Japan's first convenience store is said to have opened in 1974. Since then, they have spread throughout the country under the franchise system, and now, in 2013, there are about 45,000 of them. For the Japanese, especially in urban areas, the convenience store has become part of the modern lifestyle, a place to use any time, almost anywhere. Some people go there not just every day but several times every day. That is because convenience stores in Japan do much more than just stock food products and everyday goods.

They offer ready-to-go *bento* meals, *o-nigiri* rice balls, chilled noodles and other foods unique to Japan, and their distribution system includes many deliveries a day. The chains have gathered information on consumer preferences for goods and services, and have used that information to develop spot-on marketing systems. Nowadays the general rule is to operate 24 hours a day. The stores provide products and services people depend on, like coin-operated photocopiers, a system for paying utility bills, an ATM for deposits, withdrawals and bank transfers, and a computer terminal to pay online shopping bills, buy tickets, and get access to a wide range of information. The more users are attracted by the convenience of the stores, the harder the chains have to work to satisfy consumer demand and stay ahead of the competition. As a result, convenience stores in Japan have evolved to the point where they are considered vital to their communities.

Respect earned after disasters

Convenience stores created a very favorable impression after the Great East Japan Earthquake of 2011, and they are now regarded as an essential element of the social fabric. On the same day the earthquake struck, the chains set up emergency support centers, arranged for helicopters to take goods to stores desperate for supplies, sent employees to offer assistance, placed donation boxes on counters, and did much more, all with remarkable speed. They were prepared for this because, after the Great Hanshin Awaji Earthquake of 1995, many chains had signed agreements with local governing bodies, promising to assist people unable to return home after a disaster (for example, letting them use the store toilets and water, and providing them with road information from maps, radio announcements, etc.). The stores were also considering how to respond in other ways in the event of a future disaster. So these preparations were of great use when the disaster actually hit.

Reliable members of the community

The Safety Station (SS) program, promoted by the Japan Franchise Association with local residents and municipal governments, has prompted convenience stores to collaborate within their respective chains and serve as a safe shelter for the community. The Safety Station poster on the store's door tells everyone the outlet has implemented strong anti-crime measures, receives police patrols (in some communities), and is ready to be a reliable shelter for women, children and the elderly in a crisis.

In thinly populated places where there are few shops, or where elderly people and others have difficulty getting about for shopping, some convenience stores make deliveries using a traveling sales vehicle. Some stores use energy-saving LED light bulbs indoors to conserve energy and reduce their environmental footprint, and some recycle their waste oil and food scraps.

Japanese convenience stores are increasing their presence overseas, especially in other Asian countries, so much so that some chains have more stores outside Japan than in it. The various systems they have developed in Japan may one day be offered overseas, as well.

Left: Trucks used as Lawson traveling stores in sparsely populated areas. These trucks serve Jinsekikogen-machi in Hiroshima Prefecture.
Center: The Safety Station (SS) poster indicates that the store is a partner in the local community safety program.
Right: An ATM is sure to be found in convenience stores. ATMs in Lawson convenience stores are linked to the services of about 60 financial institutions.

Keeping Food Tasty and Safe

Agricultural chemicals and radioactive substances are known to have an adverse effect on the human body, and some bacteria and other microbes cause food poisoning. These problems threaten food safety, but Japan is rising to the challenge, as these pages show.

Photos by Natori Kazuhisa and Murakami Keiichi
Photos courtesy of the Fukushima prefectural government

Above: Furuno Takao was the first to take advantage of the rice-duck farming method.
Above right: About 1,400 duck chicks frolic in his rice fields (area: 7 hectares).
Lower right: Ducks rid the fields of weeds and pesky insects, add nutrients with their droppings, and loosen the soil with their feet and beaks, often all at the same time.

Safe and tasty rice, thanks to ducks

A wide range of organic farming methods have been tried in Japan, all, of course, without depending on agricultural chemicals. The long-held dream—and difficult challenge—of the Japanese is to grow tasty rice the organic way.

A flight from Tokyo lasting about two hours will take you to northern Kyushu, and from the airport there you are not far from Keisen-machi in Fukuoka Prefecture, a place of unusual agricultural vistas, shimmering in bright green in early summer. Cute waterfowl dart about on the water flooding the rice fields, pecking away cheerfully at weeds and insects. They are ducks, participants in a rice-duck farming method first developed more than 20 years ago by Furuno Takao. He is the owner of these fields, and a veteran organic farmer.

Organic farming takes a great deal of time and labor, making high-volume harvests difficult to achieve. This is especially true for rice farming, which requires a large area and the elimination of weeds and pesky insects. So Furuno hit upon the rice-duck farming method.

Rice fields end up being a welcoming habitat for many types of plants and creatures, so it is natural to find weeds and insects there. "They are enemies for the farmer, but they become food for ducks raised along with the rice plants. Not only that, the duck droppings make great fertilizer. This method increases biodiversity in the rice field ecosystem, and it improves productivity, too," explains Furuno.

His approach to farming starts with the desire to grow tasty, healthy food for himself and his family, and this desire inspires his efforts to supply the same type of food to others.

The rice-duck farming method is spreading to different parts of Japan and to other parts of Asia where rice is grown, such as China, the Philippines and India. "My hope is that, as this method spreads to different regions, we'll teach each other, and then the method can spread even more, developing into a form of technical know-how shared across Asia."

Targeting a food renaissance in Fukushima

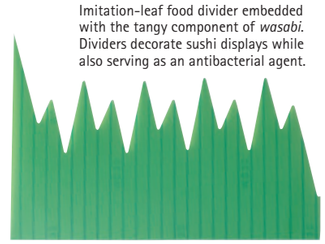
Upland areas and mountain ranges in Fukushima Prefecture tend to have a north-south orientation, making for a variety of microclimates, each nurturing one bountiful crop or another. The result is a rich variety of specialty products, including rice, vegetables (especially cucumbers and tomatoes), and fruit such as peaches, *nashi* pears and apples.

The prefecture bore the brunt of the 2011 accident at the Fukushima Daiichi Nuclear Power Station, and monitoring for radioactive substances continues. The national government's accepted limit for radioactive cesium in food for general consumption is 100 becquerels per kilogram. All rice grown in the prefecture, including that grown by farmers for their own consumption, is tested. Farm produce destined to be shipped for sale must first be tested—it is taken to the Fukushima Agricultural Technology Center and examined that day or the next, to determine whether it can be marketed. If a food sample exceeds the accepted limit, the entire harvest it came from, along with the crop scheduled to be harvested from the fields in question, is discarded, and thus kept off the market. According to research done by Fukushima Prefecture's Department of Agriculture, Forestry and Fisheries, immediately after the accident, plants being grown for food temporarily exceeded the accepted limit due to fallout, but crops grown later have remained below that.

The prefectural government launched a program called Fukushima Shinhatsubai ("Now On Sale") to inform the public about its safeguard efforts and current conditions. Monitoring results are published on the government website, and the public is invited to observe monitoring tests and participate in cherry picking and rice harvesting. The Department of Agriculture, Forestry and Fisheries, which organizes these programs, is keen for the public to come to Fukushima Prefecture, observe, and learn first-hand from the experience.

Fukushima's government continues these efforts, keen to reestablish the prefecture's reputation as a source of tasty, safe food.

People on a cherry picking tour organized under the Fukushima Shinhatsubai ("Now On Sale") program. Results of tests for radioactive substances are posted on the program's website: http://www.new-fukushima.jp/monitoring/en/



Imitation-leaf food divider embedded with the tangy component of *wasabi*. Dividers decorate sushi displays while also serving as an antibacterial agent.

A traditional ingredient joins forces with modern technology for food safety

One specialty product of Japan, *wasabi*, is a condiment that packs an invigorating bite and unique aroma that will startle an unsuspecting nose. It has highly effective antibacterial qualities, so before the days of refrigeration it was used as a seasoning for sushi to prevent food poisoning, and stored with *mochi* rice cakes to prevent mold. Wasaouro™ is an antibacterial agent that takes advantage of this kind of know-how. Its main antimicrobial constituent, allyl mustard oil, is included in plastic sheets that are used in diverse ways, like

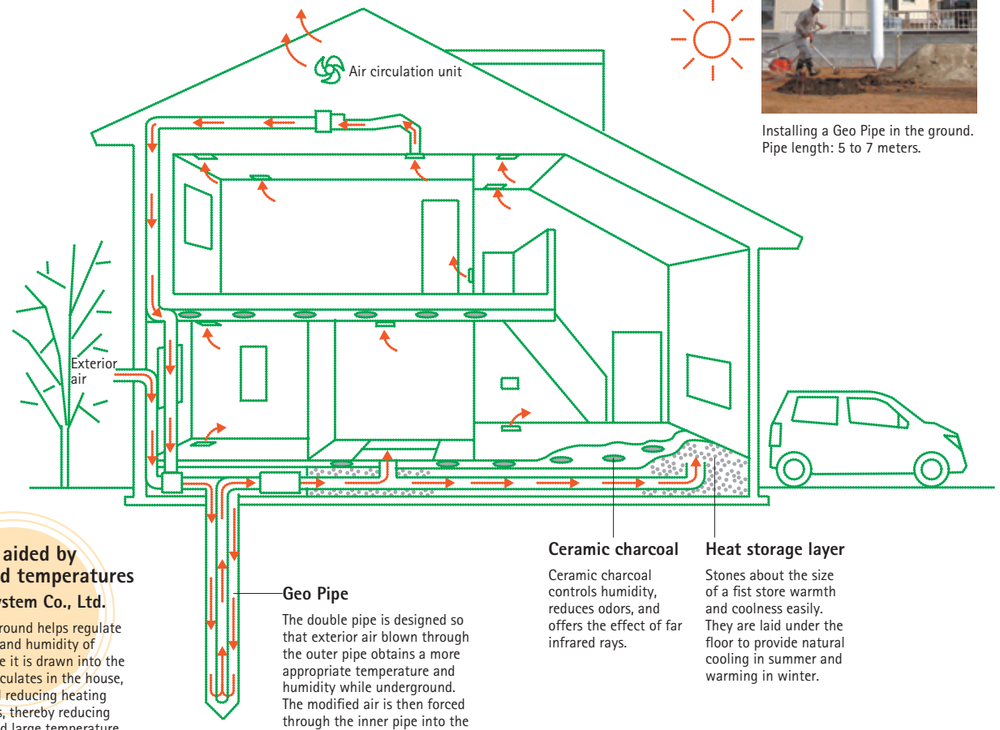
protective film and imitation green leaf food dividers for lunch boxes. And so, a food product steeped in tradition is taking a new shape for use as a modern agent for food safety.

Japanese-style Quality Helps Make Life Better

Positive living in the modern world includes a commitment to the environment, good health and crime prevention. Quality, Japanese style, has solutions that raise security and everyday convenience, both inside and outside the home.

Photos courtesy of Geo Power System Co., Ltd., TOTO Ltd., Honda Motor Co., Ltd. and SECOM Co., Ltd.
Illustration by Oguro Kenji

Installing a Geo Pipe in the ground. Pipe length: 5 to 7 meters.



Ventilation aided by underground temperatures
Geo Power System Co., Ltd.
The pipe in the ground helps regulate the temperature and humidity of exterior air before it is drawn into the house. The air circulates in the house, ventilating it and reducing heating and cooling costs, thereby reducing CO_2 emissions and large temperature fluctuations in the house. It also inhibits the entry of allergens such as pollen, dust and exhaust gases—a reassurance for people with allergies.

Geo Pipe
The double pipe is designed so that exterior air blown through the outer pipe obtains a more appropriate temperature and humidity while underground. The modified air is then forced through the inner pipe into the rooms.

Ceramic charcoal
Ceramic charcoal controls humidity, reduces odors, and offers the effect of far infrared rays.

Heat storage layer
Stones about the size of a fist store warmth and coolness easily. They are laid under the floor to provide natural cooling in summer and warming in winter.

A newly developed ventilation system provides comfortable indoor temperatures without the need for heavy-duty air conditioning and heating equipment, so it reduces CO_2 emissions. Called the Geo Power System, it uses underground temperatures because they remain relatively constant throughout the year. For example, water in a well is cooler than the air in summer and warmer in winter. The system requires a specially designed pipe placed in the ground when the house is being built. Outside air is drawn through the pipe, then circulated under the floor and throughout the house, to provide warm air in winter and cool air in summer. In addition, air moving through the special pipe is filtered to adjust humidity levels and reduce outdoor allergens like pollen and dust.

Tools for easy living

A number of products make life more comfortable and convenient in the home. There is, for example, the high-tech toilet. Its seat is heated for warm comfort on cold days. And, before the user gets off the toilet, a simple press of a button will cause a bidet nozzle to appear and send out a spray of warm cleansing water. Advanced toilets have other advantages too, like low water consumption and easy-clean surfaces. Use this toilet once, and you will want to depend on its cleanliness and comfort.

Another innovative development, the one-rider UNI-CUB personal mobility device, is now undergoing tests to explore its practical applications. It applies the balance control technology used by the two-legged walking robot, ASIMO, together with a unique system consisting of many small wheels linked together to make one large wheel. This lets the user remain seated while moving forward, backward, sideways and in other directions, simply by shifting his or her weight. In the future, people with difficulty walking may use it to get about in the home or even outside.

Super high-tech toilet
TOTO Ltd.
High-tech toilets use their own swirling action for a complete, sanitary flush that requires little water. Automation takes over to lift and lower the toilet cover, and to flush. "Neorest Hybrid Series" toilets treat incoming water with electrolysis, giving it a sterilizing capability to rid the bowl of grime that even the eyes cannot see.

Next-generation personal mobility
Honda Motor Co., Ltd.
The UNI-CUB lets the user move forward, backward, sideways and in other directions. The developer is presently collaborating with a home construction company to test whether the UNI-CUB can be a stress-free aid to mobility in the home.

Map courtesy of Mapple by Shobunsha

Peace of mind on the go
SECOM Co., Ltd.
With COCO-SECOM, family members use a computer or cellphone to pinpoint the location of a child, elderly person or other loved one. The person wearing the device can push a button on it to send an alert to the service provider, SECOM Co., Ltd.

A 21st century protector

In Japan, you will also find tools for peace of mind outside the home. For instance, take the "21st century protector," the name the manufacturer of this system gave it. It uses GPS satellites and cellphone base stations to give the location of a small, dedicated terminal device. Secure the device to a person, pet, car or other object and you can pinpoint their location with a high level of accuracy. As an example, use the service to find out the location of a child or elderly person who is late coming home. Upon request, the service provider will send emergency response personnel to the location.

As populations age faster, more and more people will surely come to depend on this kind of system.

Revolutionary Techniques to Fight Disease

Japan's medical sector is aiming to help people live free of worrisome health issues, and is spreading new techniques to other parts of the world. Its medical devices and technologies are at the forefront of innovation.

Capsule endoscope used for observations inside the small intestine. It is 11 mm in diameter and 26 mm in length, and has seen steady improvements since it came on the market in 2008. (Photo courtesy of Olympus Medical Systems Corporation)

1 Medical Devices from Japan Offer Less Pain, Less Hassle

Manufacturing dynamo Japan is applying its technologies to create some of the world's most advanced devices in the medical sector. Here is a sample of medical devices that take advantage of innovative and remarkably creative techniques. They are safe, easy to use, and less intrusive, too.

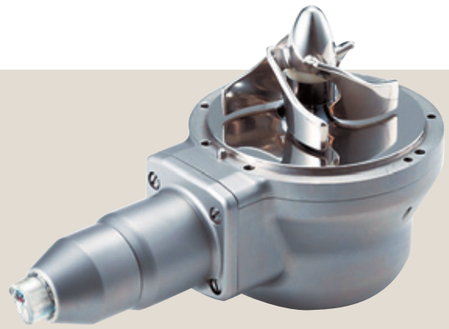
Patient-friendly capsule endoscope

Because it can peer into the stomach and intestines, endoscopy is a powerful tool for discovering abnormalities such as cancers of the digestive system and other tumors. In 1950, a Japanese enterprise was the first in the world to develop practical applications for the gastric camera, and since then many made-in-Japan endoscopes have been doing impressive work.

The small intestine is long, and far from the mouth or nose where an endoscope is normally inserted. These two factors make examinations with a tube-like endoscope difficult. So the advent of the capsule-shaped endoscope with a built-in camera and lighting system was a transformative moment. Patients no longer have to check into a hospital for the test—they simply swallow the small capsule and let it push through the digestive system and ride along with the small intestine's movements. It takes two pictures every second for eight hours. That means about 60,000 photos, all sent to a monitor screen. The capsule is excreted from the body naturally. So the intrusive effect on the patient undergoing the test is negligible.

The capsule endoscope is being considered as a tool for surgery and other medical treatments in the future.

Live a normal life—Now possible with next-generation heart assist system



The Evaheart pump is no larger than a small fist. The impeller equipped with swept-back vanes (40 mm diameter) uses centrifugal force to circulate the blood. A cable links the pump to an external controller that operates the system. (Photo courtesy of Dr. Yamazaki Kenji)

More than 250 heart patients in Japan are reported to be waiting for a heart transplant, and until they receive it they are attached to an artificial heart-assist system. These types of systems are being steadily improved in Japan, and a next-generation advance, the Evaheart, is a heart assist system developed by a project headed by Dr. Yamazaki Kenji. He is a professor at Tokyo Women's Medical University, and director of the Department of Surgery there. The main components of the Evaheart system are: a pump attached to the left ventricle of the poorly functioning heart to send blood through the main artery; external compact batteries and a controller to operate the system.

Patients using other heart assist systems may experience problems such as an erratic pump that forces them to remain in the hospital for a long time. The Evaheart avoids this with two distinctive features: its pump is highly reliable and durable thanks to a rotating impeller with swept-back vanes; and it is made with precision technology that helps prevent blood vessels from becoming blocked. So patients do not have to be hospitalized for a long time, and can go about their lives as they normally would.

A device to measure sleeping patterns

A surprising number of people are concerned about the quality of their sleep. If they are keen about monitoring their own health they may want a newly developed mat sensor that monitors and analyzes sleep quality in the home. It easily measures sleep duration and sleeping patterns, and its precision is similar to devices medical institutions use to examine similar factors.

Slip it under your bedding, flip the switch and lay down. While you are in bed it will automatically record your movements, breathing patterns and pulse. Then after your sleep, check the recorded data on your computer.

The display tells you how deep you slept, your sleep cycles and more, giving you your sleeping patterns at a glance. The precision measurement technology brings another aspect to monitoring one's own health.

Slip the mat under your bedding, and Sleep Scan will monitor your sleeping patterns for you. (Photos courtesy of Tanita Corporation)

Pain-free injections, thanks to precision technology

Injections used to hurt mainly because of the thick needle. But when a Japanese company began marketing the world's thinnest hypodermic needle in 2005, the big surprise was: No pain! Before then, needles for inoculations and other medical purposes had a diameter of 0.4 mm, but the new needles were only 0.2 mm. Halving the diameter meant reducing the tip area to about a quarter. Medicinal solutions pass through a hole that has an interior diameter of 0.08 mm.

To facilitate injections through such a small needle, the needle tip is very thin but the base is larger. This design is possible thanks to a precision press manufacturing technique that rolls a super thin metal sheet into a cylinder. In 2012, a needle with an even thinner tip diameter—0.18 mm—began making life even easier for diabetics who must use needles daily.

The Nanopass II needle for diabetics' insulin injections, developed jointly by Okano Industrial Corporation and Terumo Medical Corporation. (Photo courtesy of Terumo)

A blood pressure monitor to indicate blood vessel condition

Blood vessels lose their elasticity and arteries may harden as people age, or when substances such as cholesterol build up. This can cause a stroke or heart attack. Over the last few years a growing number of homes are using a digital blood pressure monitor, and now you can get a monitor that checks the condition of your blood vessels just about as easily.

A device that does this in about two minutes came on the market in 2011. Wrap the cuff around your upper arm to obtain readings for the artery at that location and the elasticity of your aorta, the largest artery in the body.

The device is useful as a tool to warn about possible hardening of the arteries, and will likely be instrumental in boosting awareness of health issues.

Using the same method as the blood pressure monitor, this digital blood pressure monitor for medical use, called Pasesa, displays numbers indicating maximum and minimum blood pressure, pulse, pulse pressure, and the extent of blood vessel elasticity. (Photo courtesy of Shisei Datum Co., Ltd., with the collaboration of RIKEN and the National Institute of Advanced Industrial Science and Technology)

2 Medical Therapies for the World, Pioneered in Japan

Researchers in Japan are working every day on new ways to treat illness. For many of them, the critical focus is developing reliable therapies for intractable diseases and cancer. These pages highlight new discoveries in two fields now in the spotlight worldwide: iPS cell technology, and heavy particle beam cancer therapy.

iPS cell technology— Using multi-purpose cells to conquer intractable diseases

The 2012 Nobel Prize in Physiology or Medicine was awarded to Professor Yamanaka Shinya, the Director of the Center for iPS Cell Research and Application at Kyoto University. The prize recognized his 2006 achievement of creating induced pluripotent stem (iPS) cells from mouse skin cells.

The fertilized human egg splits into cells (human somatic cells), each having some special function. After somatic cells mature, they are no longer able to transform themselves into cells with a different function. Professor Yamanaka, however, discovered that, by adding four genes to mouse somatic cells, it is possible to induce the cells to become like fertilized cells; in other words, like cells that have not yet been assigned a function. What he made were iPS cells.

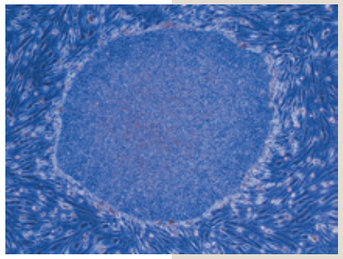
Within iPS cells lies the powerful potential to drive new medical advances, especially regenerative medicine and the discovery of new drugs.

In the field of regenerative medicine, there are hopes that iPS cells will be used to make cells for different organ tissues which can be transplanted into the patient's body. The goal is to regenerate lost functions. In Japan, preparations are underway to conduct the world's first clinical research using iPS cells to treat age-related macular degeneration (degeneration of the central part of the eye's retina, as the body ages).

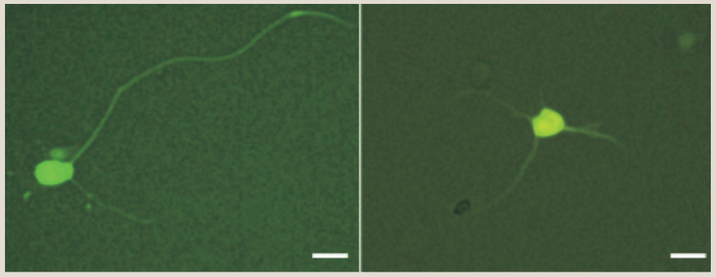
Professor Yamanaka Shinya was awarded a Nobel Prize for creating induced pluripotent stem (iPS) cells.
(Photo courtesy of the Center for iPS Cell Research and Application, Kyoto University)

Research focusing on developing new drugs offers hope for treating diseases that are presently incurable. One such disease is amyotrophic lateral sclerosis (ALS), in which the muscles of patients weaken quickly to the point where, finally, they are unable to breathe. Professor Nakahata Tatsutoshi, a Deputy Director of the Center for iPS Research and Application, explains: "In the case of ALS, motor nerves that are supposed to control muscle movement degenerate and eventually die, causing the muscle to weaken. We know this much, but we still don't understand why the motor nerves degenerate, so we still can't develop a therapy for the disease."

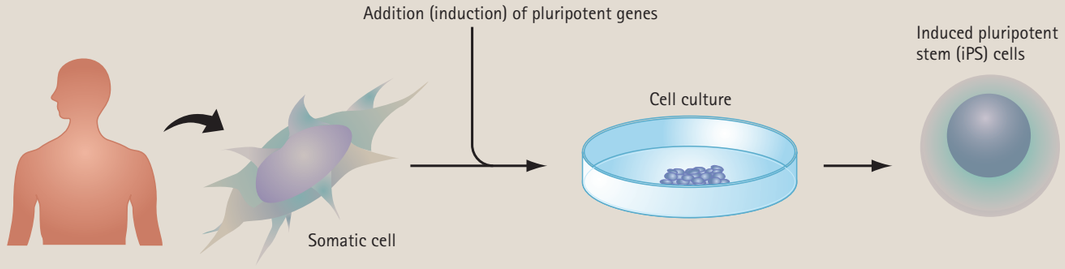
Even so, research into iPS cells may be able to zero in on the cause and mechanisms of the disease. If researchers can develop iPS cells using a patient's own cells, they should be able to make motor nerves that have the genes of the patient. Two steps leading toward success are: observing when motor nerves develop abnormalities, and then pinpointing why they do that. This could lead to the development of new therapeutic drugs. Says Professor Nakahata, "For incurable diseases whose cause is still unknown, developing a treatment using iPS cell technology would be a really dramatic breakthrough. Japan leads the way in basic research on iPS cells, and we hope to advance our applied research to the stage where we can help patients, and show the world how this can be done."



A cell assembly of human iPS cells made from fibroblasts (cells in connective tissue). The assembly measures about 0.5 mm across. (Photo courtesy of Professor Yamanaka Shinya, Kyoto University)



The motor nerves of amyotrophic lateral sclerosis (ALS) patients (above right) are far shorter than those of a healthy person. The bars in the illustrations indicate a length of 10 micrometers.
(Courtesy of Inoue Lab, Center for iPS Cell Research and Application, Kyoto University)



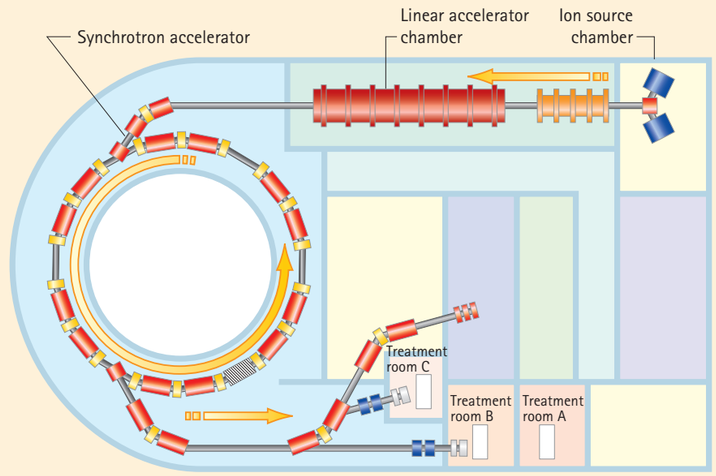
By adding several genes to somatic cells from skin or some other organ,
it is possible to make iPS cells that can transform themselves into different types of cells.

Beating cancer with heavy particle beam therapy

Japan has the longest average life expectancy in the world, and yet cancer remains the country's number-one killer. More and more people are dying of cancer worldwide. New treatment methods are being developed almost on a daily basis, and one of them attracting plenty of attention is heavy particle beam therapy.

Heavy particle beam therapy is a type of radiation therapy in which cancer cells are attacked with high-frequency beams of carbon ions. The strong beam is focused on a small area, so it can offer effective treatment in a short period of time, and has few side effects. Clinical trials of heavy particle beams began in 1994 at Japan's National Institute of Radiological Sciences, and the new method has been used to treat more than 7,000 patients so far. Bone cancer and muscle cancer are difficult to cure using other methods, but heavy particle beam therapy can be highly effective.

France, China, the Republic of Korea, Malaysia, Russia and Saudi Arabia are some of the countries considering adopting it, and there is hope it will play a key role in curing cancer in the future.



The world's first heavy particle accelerator (HIMAC) takes up about the same space as a soccer field. The large accelerator creates carbon ion beams used in medical treatments.

Tasty Japan:
Time to Eat!

1

Katsuo no Tataki

Bonito fish, prepared like a rare steak

Photos by Arai Akiko Collaboration: Neboke Restaurant

The warm Kuroshio current flows up the Pacific Ocean past Kochi Prefecture, making fishing a major industry there. Kochi is known for its catches of a fish called *katsuo* (bonito), and its bonito consumption is reported to be the highest in Japan. One way to prepare bonito, developed there, is *katsuo no tataki* ("pounded bonito").

In Japanese cuisine, *tataki* generally means pounding raw fish with a knife to mince it, then mixing in a condiment like *shiso* (Japanese basil). But *katsuo no tataki* is not prepared like that at all. First, the fish is cleaned and filleted. Then the skin sides are broiled over a straw or charcoal flame until they are evenly scorched. Next, coarse salt or a soy sauce/citrus juice mixture is sprinkled on the fillets, which are then given light taps with the back of a kitchen knife or the hand, to work the seasoning into the flesh. This preparation method gets its name from the fact that the seasoning is tapped (*tataki*) lightly into the *katsuo* fish. Generally the fillets are enhanced with thin slices of garlic and the soy sauce/citrus fruit mixture, although recent innovations include grated ginger or mayonnaise instead.

There are a number of theories about how this preparation method began. One is that in the early 17th century Yamauchi Kazutoyo, the lord of the Tosa domain (present-day Kochi Prefecture), prohibited the eating of *sashimi* raw fish to prevent food poisoning, but the common folk would scorch just the exterior and pretend it was broiled right through. Another explanation is that the dish began in the early days of Japan's modernization (after 1868), to give Westerners a taste of something close to grilled steak.

A restaurant serving Tosa (Kochi) cuisine in Tokyo's Akasaka district uses bonito caught the traditional way, with a pole and line to protect the fish from injury. This lets the restaurant offer fresh, firm fillets.

Bonito arrive off the coast of Japan in spring and fall, creating the opportunity for seasonal dishes twice a year. In spring, they swim north with the warm current, bearing little fat and providing a lighter taste, while in the fall they ride the cold current south, fatter and ready to provide a heartier flavor. So each seasonal dish offers a different *katsuo no tataki* taste.

There are different cooking styles, as well. You could, for instance, broil the fish and then chill it in ice water, or broil only the skin and not tap in any seasoning. Narumiya Kenji, the head chef at the restaurant in Akasaka, says, "In Kochi it's common to eat it while the skin's still warm. Be sure to use coarse salt—that gives it a more intense flavor."

When prepared this way, the skin is crisp, savory and warm, while the flesh will be cool with a pliant texture, something like a rare steak.

Kochi's traditional *tataki* cuisine is now found in many bars, restaurants, and supermarkets. The refreshing taste of the soy sauce/citrus juice mixture combines with the zesty tang of garlic to bring out the flavor of both, and the texture is something like a steak grilled rare. This preparation suites the tastes of people today and is popular across the country.

Left: *Katsuo* (bonito) caught with a pole and line.
Center: Narumiya Kenji, the head chef at Neboke Restaurant, filleting bonito.
Right: The skin is broiled evenly over a charcoal flame.

Strolling Japan 1

Itsukushima Shrine and the Island of Miyajima

Photos by Ito Chiharu Map by Oguro Kenji


1


2


3


4

1. These posts for the huge *torii* gate came from a camphor tree that was 500 to 600 years old when cut.
2. The brilliant vermilion pillars and beams add to the beauty of the East Corridor leading to the inner shrine.
3. A lush forest forms the backdrop to Itsukushima Shrine's sacred buildings, which are reflected in the water at high tide.
4. Noh theater stage constructed in the 1600s. A ritual night Noh performance is presented every April.
5. Ferry on its way to Miyajima. When the tide is right it sails close to the large *torii* gate.
6. Grilled sea eel coated with a thick soy-sauce flavored sauce is placed on rice and served in a dish called *anago meshi* at Ueno Restaurant.


5

An island of natural beauty and history

The island of Miyajima in Hiroshima Prefecture is home to Itsukushima Shinto Shrine, a World Heritage Site since 1996. To get there, I rode about four hours on a high-speed Shinkansen train from Tokyo to Hiroshima, then took a local train from there to the island's gateway, Miyajima-guchi, about 30 minutes away. I arrived before noon, and someone told me about an old, reputable establishment near the ferry wharf. It serves *anago meshi*, a tasty Miyajima specialty featuring rice and sea eel, so I decided to eat before crossing over to the island.

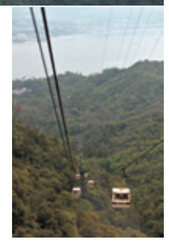
After lunch I took the ferry and soon approached, on my right, the shrine's immense *torii* gate, painted in vermilion. It took the ferry only about 10 minutes to reach the dock at Miyajima Wharf. I used the walkway along the seacoast toward the shrine and was soon greeted here and there by wild deer. The island, nestled on


6

Many deer live on Miyajima, and they have inspired the design of these souvenirs. Left: Earthenware bell (monkey riding a deer). Right: Wooden fork.

Small *momiji manju* sponge cakes come with many kinds of filling such as sweet bean paste, sweet beans, custard, chocolate, and *matcha* green tea.

Mist over the Seto Inland Sea creates a dreamlike mood. People at the lookout showed their pleasure with the scene verbally and by clicking their camera shutters time after time.



waters in this part of the Seto Inland Sea, has been revered as a god since ancient times.

The shrine buildings are stupendous examples of architecture in a style dating back about 850 years. They were originally constructed under the orders of Taira no Kiyomori, the first man of military origin to hold political power in Japan. He had developed considerable economic influence through intensive trade with China, and the Seto Inland Sea was an extremely important maritime route for him. The island occupied a strategic position along the route, and he held strongly to the belief that the island was a sacred place for the god protecting navigation. The inner shrine standing today, reconstructed in the 16th century, is said to admirably depict the style of Kiyomori's time. The inner shrine is the focal point for a number of shrine buildings that are oriented toward the sea and connected with roofed corridors extending like the wings of a bird. One central feature is a long platform facing the *torii*. At high tide, the vermilion shrine buildings seem to float on the water, and this, together with the green highlands forming a backdrop, creates a truly magnificent scene.

If you visit at low tide you can walk out to the *torii*. It is 16 meters tall and stretches out 24 meters. Stand under it and look straight up—it has a special force and presence of its own. At 5 tons its weight defies the buoyant effect of water, and its stability against the force of water and gravity are part of its magical effect.

After I paid my respects to the shrine I decided to climb to the highest point on Miyajima, Mount Misen. The entire mountain was revered, and today a lush virgin forest remains on its slopes. In autumn the leaves add color and beauty at Momijidani Park, and near there is the base for a ropeway system. It will take you up into the air and to the final station at the top, in about 20 minutes. Near there is the Shishi-iwa Lookout, offering a fine view of islands in the inland sea.

I came down Mount Misen and strolled to the Omotesando walkway leading to the shrine. It is lined with shops selling souvenirs and small restaurants. A forever-favorite souvenir from Miyajima is *momiji manju*, small sponge cakes in the shape of *momiji* maple leaves with a sweet bean paste or some other ingredient stuffed in the dough before baking. Many shops along the walkway bake the cakes right there, giving you an opportunity you will not want to miss. Another popular souvenir is Miyajima *shamoji* rice scoops, said to bring good luck. Specialty shops on the walkway have scoops for everyday use, of course, but also a lineup with a wish inscribed on them, like *Shobai Hanjo* ("success in business") and *Kanai Anzen* ("safety in the home").

"We can inscribe names on them right here," says one salesperson.

A shop called Shakushi no Ie offers many kinds of ladles, spatulas, and butter knives. You can have your name or a message you like inscribed on a small ladle-shaped strap for your cellphone.

On the Omotesando walkway leading to the shrine, a bride and groom happened to go by on a rickshaw, coming from a wedding most likely at Itsukushima Shrine.

"Grilling oysters must be done just right," says Yamada of the restaurant Miyajima no Kaki-kun. This is the only place where you can get oyster gratin, an opportunity not to be missed.

"People from other countries often ask us to write their name on one in *kanji* characters."

I left the shop and walked a bit further, then noticed a nice smell wafting my way from somewhere. Oysters were being grilled on an open flame in a small shop. They live in the sea close to the island and have added to its fame. I wasted no time ordering some, and they made a light feast, breaking up my stroll perfectly.

The sun was sinking, letting Miyajima wrap itself in the mood of twilight. This gave the shrine a different kind of eloquence. After sunset and until 11:00 pm, the immense *torii* and shrine buildings are illuminated, making them float above the dark sea in a surreal tableau. Before heading for my lodging, I faced the shrine and put my hands together in prayer, giving thanks for the day I had spent with the island's gods.

After the hustle and bustle on the Omotesando walkway, it is nice to slip into the tranquility of Machiya-dori Street, once a busy place itself. In the background stands a five-storied pagoda constructed in 1407.

The immense *torii* gate is illuminated after dusk. Sometimes boats slip under its arch at high tide.

Getting there
From Narita International Airport (Tokyo), take the Narita express to Tokyo Station (about 1 hr). From there, about 4 hours on a Tokaido-Sanyo Shinkansen train to Hiroshima Station. (If you want to fly, about 80 min. from Haneda Airport (Tokyo) to Hiroshima Airport, then about a 50-min. bus ride to Hiroshima Station). From Hiroshima Station to Miyajima-guchi Station on the JR Sanyo Line, about 30 min. Then take the Miyajima ferry (about 10 min).

For more info
Miyajima official tourism website
(Chinese, English, French, German, and Korean):
http://visit-miyajima-japan.com/
Miyajima Tourist Association website
(Chinese, English, French, German, and Korean):
http://www.miyajima.or.jp/

Souvenirs of Japan 1

Chopsticks

Photo by Ito Chiharu　Collaboration: Ginza Natsuno

Almost 30% of the world's population uses chopsticks. Japanese chopsticks are part of a distinctive culinary culture—in the home, many people have their own tableware and eating utensils, and chopsticks are no exception. The Japanese find it completely natural to use their own chopsticks, meal after meal. Some even take their own chopsticks with them to use when eating out.

A chopstick specialty shop in Tokyo's Ginza district displays many types from all over the country. Some are coated with lacquer, others decorated with mother of pearl, or carved out of a high-quality wood, or made to be used only for *ramen* or *udon* noodles. You would be surprised by the tremendous variety. There are even short ones for younger hands to use with ease.

If you come to Japan, you might want to get your own chopsticks and use them every day at mealtime. Another idea: buy a pair that you think would fit someone's personality. It might make a good souvenir from Japan.

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