TEPIA Advanced Technology Exhibition Hall

EXPERIENCE
THE ADVANCED TECHNOLOGY
OF THE FUTURE

TEPIA Advanced Technology Exhibition Hall is…

An exhibition hall where you can experience Japan's most exciting advanced technologies. Come and take part in creating our future!

[♫ 000]＝sound guide is available

Entrance Hall

Some new features of technology have been installed in the Entrance Hall for TEPIA visitors to enjoy. They include a giant 4K TV screen, technology that can estimate age and gender, and a liquid crystal display made by processing a revolutionary type of glass.


◆REGZA

This television successfully combines a larger screen with a sense of fine detail, to reproduce digital terrestrial broadcasting and other moving images more beautifully than ever.
(TOSHIBA CORPORATION)


◆Segment Sensor

Based on video images from cameras at entrances to commercial facilities and elsewhere, this sensor uses face sensing technology to automatically estimate visitor attributes such as gender and age.
(OMRON Corporation)
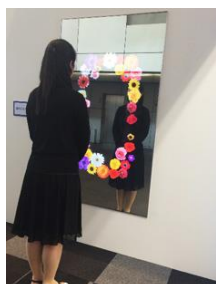
◆INTELUX

This is a revolutionary display, with special glass processed to look like a mirror attached to the front of a liquid crystal display.]
(Zikoo LLC)
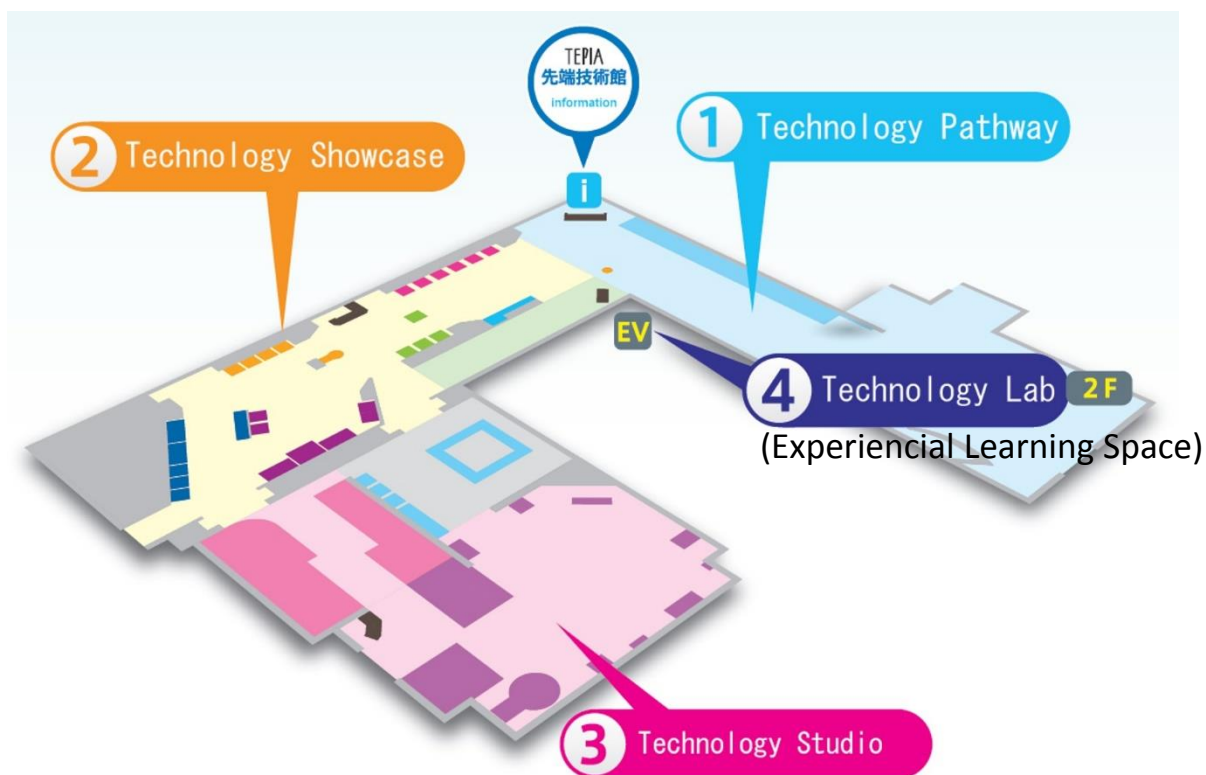
Technology Pathway [♫ 001]

– Technology makes ideas, ideas make technology –

 The Japanese robot and the generic technology which play an active part at the forefront of manufacturing of the world.

You feel a possibility of the Japanese high technique that I turn the spotlight on generic technology of a robot and the achievement field here, cut the bright future and hold.

Japan's robot technology is leading the world of robot industry. This technology is thought of as a crystal of basic technologies to support Japanese industry. The critical components that make up the robot, have been used in so many of advanced technologies. Here we can look at Japan's robot technology. Then, please feel the future possibilities.

◆VS-060（ by DENSO WAVE Co.,Ltd ）

VS-060 is an industrial robot that achieves high-speed performance of the class top-level 4Kg Nomadic.

From a standard assembly and transport, or a surface inspection of the product of early complex shape whether it is curved and polished, such work to tighten the screws,it can be done with

advanced technology that is comparable to the work of skilled workers.

2

Technology Showcase
– What future world do the developers envisage? –

What sort of new technologies are being created in the whole of society around us? Here, we introduce technologies that will change the world, and the ideas of their developers, from five different angles – "Health Care", "Lifestyle", " ICT", "Security" and "Energy".

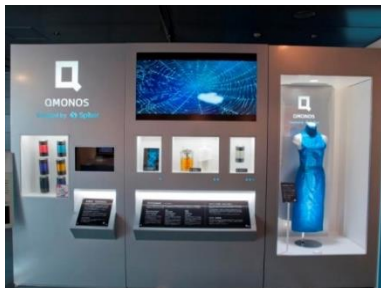**Health Care**

Lifestyle

ICT

Security

Energy

Special Exhibition
◆QMONOS [♫ 002]

●**What type of technology is inside?**
They say that spider silk is the strongest fiber in the world. If it is possible to make a spider silk thread 1cm thick, it will make a material so strong that it could stop a jet that is taking off. It was much hoped that the mass production of artificial spider silk could deliver a new dream material that does not use petroleum, and "QMONOS" has made the dream come true by succeeding in its mass production for the first time in the world. Spider silk is a "protein" that also makes up our bodies. The mass production of artificial spider silk is made possible by culturing microorganisms as hosts of genetic information of the protein, which enables the microorganisms to produce the protein efficiently. Produced protein materials can be used for making a wide range of materials in various forms, including fiber films, sponge, powder and nanofibers. They can also be dyed in different colors.

●**What is the potential of this technology?**
Because "QMONOS" is a sophisticated material with excellent shock-absorbing properties, biocompatibility, etc., it makes it possible to produce new products, including cars that never cause any injuries in collision, self-dissolving surgical sutures, and UV-absorbing clothing.

●**What challenges are there in the future?**
Our research is currently underway for practical applications of "QMONOS" at our Prototyping Studio which was built in 2013. We are developing a more efficient production method which realizes production capacity to supply synthetic spider fibers on a global scale.

(Spiber Inc.)

◆ **Bio-Texture Modeling** [♫ 003]

●**What type of technology is inside?**

In the case where a surgical operation is necessary, a surgeon normally plans the operation and explains it to a patient by using organ images captured by medical diagnostic equipment, such as a CT (computerized tomography) scanner or an MRI (magnetic resonance imaging) scanner. However, it is often difficult to provide a thorough picture of the situation for the patient simply by showing planar images.

 The Bio-Texture Modeling technology makes it possible to form highly accurate 3-D organ models based on CT or MRI data by using a 3D printer. Special types of resins are also used for re-creating the tactile sense, hardness and softness of organs, as well as making organ models partially transparent so as to show blood vessels and bones, and lesions in them.

●**What is the potential of this technology?**

By listening to explanations about the operation a patient is going to undergo while looking at an authentic model of the patient's organ, even including a lesion, the patient can more easily understand the details of the operation. The operation can be simulated by the surgeon (mock operation) using the 3-D organ model that even re-creates the sensations of cutting and removing parts of the organ.

●**What challenges are there in the future?**

The Bio-Texture Modeling technology has been used increasingly by medical institutions and research/medical education institutions, and is expected to become more widespread in the near future. The further development of the Bio-Texture Modeling technology is underway to make organ models that re-create even more realistic textures.

(FASOTEC Co., Ltd).
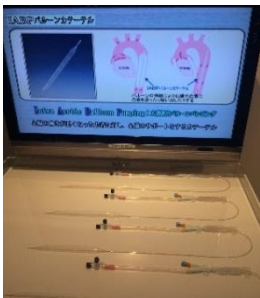
◆ **IABP (Intra Aortic Balloon Pumping) Balloon Catheter** [♫ 004]

●**What type of technology is inside?**

An IABP catheter is a medical device that aids the functions of the heart. It is inserted through a blood vessel in the groin area into an artery near the heart, and is used for emergency treatment of patients who have suffered heart attacks. The balloon is inflated to make it easier for blood to flow to vessels near the heart (coronary arteries), in the head, and in other important areas of the human body, then deflated to assist the heart in pumping this blood throughout the body. Repeating this process in conjunction with heart movements relieves stress on the heart when clogged vessels have caused it to malfunction. Until now, these catheters have only been made overseas. Existing products are too long for the relatively small Japanese anatomy; the inflated balloon has been known to block important blood vessels in the abdomen and cause complications in the bowel, kidneys and elsewhere. This device, the first domestically produced IABP catheter, is designed to suit the Japanese anatomy.

●**What is the potential of this technology?**

It is the ideal size for the Japanese body and reduces the risk of complications. The tube is made of soft polyurethane, so that it can also be used for patients with meandering blood vessels. The balloon material has been improved to make it less susceptible to bursting.

●**What challenges are there in the future?**

The technology is also being applied to catheters used to treat liver and brain disease.

(Tokai Medical Products, Inc).

◆ **Narrow Band Imaging NBI**   [♫ 005]

●**What type of technology is inside?**

Cancer of the digestive organs is affecting more and more people each year. At Olympus, we are developing endoscopic technology that will enable the color and structure of mucous membranes on the surface of intestines and other organs to be observed more naturally and in more detail, facilitating the early discovery and treatment of cancer and other lesions. For cancer cells to multiply, they need to absorb nutrition from blood vessels. This is why blood vessels are thought to concentrate more readily in mucous membranes near lesions. Using blue and green light that is easily absorbed by hemoglobin in blood, Narrow Band Imaging (NBI) highlights blood vessels on the surface and in deep areas of mucous membranes, vividly capturing them on a screen. By using its special blue light to emphasize and illuminate changes in membrane areas, NBI contributes to the early discovery of lesions.

●**What is the potential of this technology?**

NBI vividly displays clusters of fine capillaries to aid the discovery of microlesions such as small early-stage cancers that have been difficult to see until now.

●**What challenges are there in the future?**

As well as the early discovery and diagnosis of cancer and other lesions, another promising aspect is the development of endoscopy for treatments that place minimal stress on the patient's body.

(OLYMPUS CORPORATION)
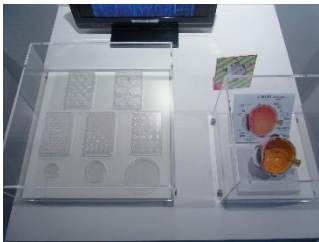
◆ **CELL-SHEET ENGINEERING**   [♫ 006]

●**What type of technology is inside?**

Existing cornea transplant surgery makes use of corneas from other people. Yet transplanting organs from other people can often result in rejection, and in recent years, research and development has focused on transplanting regenerated cells grown from the patient's own body.

CellSeed is a company that uses special Petri dishes with a surface that changes properties with temperature as a means of growing human cells for use in regenerative medicine. This Petri dish is designed so that cells clump together when the temperature is best suited to cultivation at 32°C or more, with cells automatically spreading apart at lower temperatures. Cells grown in a sheet on the Petri dish can be taken off without using any reagents, and without causing any damage. With this technology, epithelial cells is mucous membranes taken from the patients' mouth can be used to create "Corneal regenerative sheet."

●**What is the potential of this technology?**

It can be useful for treatment of corneal epithelial stem cell deficiency and other diseases of the cornea that were difficult to treat. There is a lower impact on the patient, and treatment uses a much safer method.

●**What challenges are there in the future?**

In addition to corneas, cell sheets for heart muscles, the esophagus, cartilage and periodontal tissue are also under development. These will hopefully be used at medical sites not only in Japan, but around the world.

(CellSeed Inc. /Tokyo Women's Medial University)

◆ Fully automated DNA testing Chip　[♫007]

●**What type of technology is inside?**

Until now, large expensive devices were required to study individual genomes, and such studies could only be conducted at specialist research facilities. Analysis also took a long time, which meant any feedback on results also took time. Using this genetic testing chip allows low-priced test results to be acquired in a short time. This can ensure that genetic testing becomes more mainstream, and may even lead to an increase in tailored medical care. This system was developed from three elemental technologies: a compact, high-pressure pump; high-speed PCR (polymerase chain reaction) technology; and high-sensitivity electrochemical sensor. * A method that can be used to increase a target DNA string out of many DNA strings that store genetic information.

These research results were recommended by joint research program with imec.

●**What is the potential of this technology?**

If genetic analysis becomes mainstream, common illnesses and side-effects of medicines could be studied easier, making it easier to prevent them in the future.

●**What challenges are there in the future?**

The type and quality of data required by medical and research institutions will be investigated further with the aim of commercialization and further development. (Panasonic Corporation)

◆Multiple Degrees of Freedom Myoelectric Prosthetic [♫008]

●**What type of technology is inside?**

Imagine losing a limb in an accident. It will be difficult to get through everyday smoothly. Brain machine interface (BMI) is a technology that connects the brain and nerves to a machine. BMI can improve the quality of lives of people with disabilities. For example, using the BMI technology, you can move a prosthetic hand simply by "thinking to move it". A command (electrical signal) that conveys a movement from your brain to your hand is extracted from a skin surface. The command is then analyzed and sent to your prosthetic hand to move it as you wish. In addition, the sensor in the palm sends the feeling of touch back to the brain. The Multi-DoF EMG prosthetic hand also has artificial finger muscles and joints which make the appearance and motions of the hand extremely realistic.

●**What is the potential of this technology?**

The BMI technology enables people who have lost their hands to do household chores and work almost as if they had their own hands. The Multi-DoF EMG prosthetic hand can improves the quality of life (QOL) significantly.

●**What challenges are there in the future?**

We will develop the BMI technology further so as to achieve smoother movements of prosthetic hands and realize the production at lower cost. We foresee a future where prosthetic hands are something "cool" and are available to everyone - the young and the old alike.

(The University of Electro-Communications（UEC Tokyo))

◆ Robot car "EPORO" [♫ 009]

●What type of technology is inside?

Fish can swim in schools while avoiding objects in their way. This is because the school changes its movement using three rules - collision avoidance, swimming side-by-side, and proximity - to suit the position of other fish.

The habits of these schools of fish has been applied to develop the robotic car "Eporo." "Eporo" employs sensors by using laser light reflections to measure the distance to objects, in a similar way to the "lateral line sensitivity" that fish used for collision avoidance. Wireless communications for short distances takes the role of the wide field of view that fish have that enables them to swim side-by-side and for proximity. With these "two eyes," "Eporo" is capable of adjusting its position with other cars and drive safely and efficiently in groups.

●What is the potential of this technology?

If groups of cars move in a similar way to schools of fish swimming around and drive together, more cars can be driven along the same type of roads, which can help to reduce traffic congestion.

●What challenges are there in the future?

Development of more precise intercommunication technology is being conducted to apply the technology to actual cars.
(NISSAN MOTOR CO., LTD.)

◆ αGEL® [♫ 010]

●What type of technology is inside?

"αGEL®" is a soft gel-like material made mainly from silicone. Its shock absorption and vibration damping properties are so strong that a sheet only 2 centimeters thick can stop a raw egg dropped from a height of 18 meters without breaking it.

To take advantage of these properties, αGEL® is used on the bottom of sports shoes to protect the body from impact when the feet land on the ground. Then, it has a wide variety of other uses; its pleasant feel is suitable for the grips of writing utensils, while its capacity to disperse pressure is ideal for use in nursing care mattresses to prevent bedsores. αGEL® is also used to protect smartphones, wristwatches, medical devices and other hi-tech equipment from impact and vibration.

●What is the potential of this technology?

Besides αGEL® itself, a variety of functions can be added or applied by combining it with various other materials.

●What challenges are there in the future?

We are studying its further applications to the growing trend for "wearable devices," as well as the fast-evolving field of car electronics. There is an exciting future ahead for αGEL®.
(Taica Corporation)
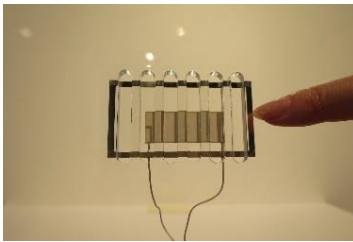
◆ piezo film speaker　[♫ 012]

●What type of technology is inside?

With various types of thinner digital devices being developed, transportation costs and more efficient use of resources has become a reality. Yet conventional electromagnets used in speakers had reached their limit of thickness due to structural constraints. Focus then turned to "Piezo elements" that change their volume when a voltage is applied. Thin speakers were developed by combining these elements with plastic films so that the entire sheet vibrates. The result has wider sound propagation than conventional speakers such that sound is delivered evenly 180° around the front, as well as playing back complex sounds such as rain and applause with exceptional clarity.

●What is the potential of this technology?

Utilizing the sheet in thin TVs, tablet devices, computers and cars, more and more digital devices can be designed to be thinner and with greater functionality. The sheet can even be applied to walls and windows.

●What challenges are there in the future?

Tuning technology will be refined for use with any shape device with the aim of developing speakers that can be used in various types of digital devices.

(KYOCERA Corporation)

◆ SmartAR　[♫ 013]

●What type of technology is inside?

AR (Augmented Reality) is technology that superimposes text, computer graphics and other information on top of real images displayed on a screen via a camera. This can be used to display route guidance on top of scenery before one's eyes, or create a brand new visual sensation that cannot be experienced ordinarily with the use of virtual objects.

"Smart AR" is a technology that advances AR further by utilizing convenient information more intuitively. Conventional AR required specialized markers such as barcodes to initialize them, however they can now be started by identifying ordinary objects such as photos or drinks. Sony's proprietary 3D space awareness technology allows AR information to be displayed smoothly to suit the movement of the camera. Methods to display computer graphics such as shadows and different angles are also being developed. These can be used on ordinary smartphones and tablet devices without having to use special equipment.

●What is the potential of this technology?

Large-scale, dynamic AR can now be experienced like never before. New forms of entertainment are also available, including games and advertising.

●What challenges are there in the future?

Further technical improvements are being devices to allow utilization in fields requiring high levels of precision, such as support for surgical operations and assembly of precision equipment.

(Sony Corporation, Sony Mobile Communications Inc.)

◆ 3D Haptics Technology [♫ 014]

●**What type of technology is inside?**

"3D Haptics Technology" digitally reproduces the sensation of touching objects in three-dimensional space.

Devices incorporating this technology use various types of vibration to create illusions in the brain. Simply by wearing the device on a finger, the user can experience real sensations of "pressure", "touch" and "force" in space where nothing at all exists. Virtual objects created by computer graphics feel as if they actually exist and are being touched by the hand.

The device structure is simple and the shape can be designed freely. This characteristic makes it easily adaptable to game controllers, wearable devices, mobile terminals and other appliances.

●**What is the potential of this technology?**

Games with a sense of reality can be created using the synergistic effects of visual and tactile stimuli. Its use in game controllers will enable gamers to enjoy sensations not possible until now, such as a sense of floating. Three-dimensional data for 3D printers can be manipulated like kneading clay, while robot arms may also provide tactile sensation for use in systems supporting remote surgery by robots.

●**What challenges are there in the future?**

We aim to broaden the presence of 3D haptics technology and achieve future communications by bridging distances between locations with tactile sensations or virtual handshakes**.**

(MIRAISENS,Inc)

ICT

◆ Sharelog 3D [♫ 015]

●**What type of technology is inside?**

Sharelog 3D has been developed as public art (artworks installed in public spaces, rather than limited spaces like art galleries) based on data from IC cards used to access public transport. Transport IC cards retain data on a maximum of 20 trips from station to station made by their owner in the past. These data are read using a dedicated card reader, then matched against a database of coordinates for the stations used. The owner's history of movement then becomes a trail of light mapped on a 3D map synthesized from a model of the city, projected as video art in front of the viewer. This is a public artwork in which viewers can participate and enjoy the experience of seeing their own movements traced from a bird's-eye view.

●**What is the potential of this technology?**

Public art involving viewer participation will provide new surprises and enjoyment to people who gather in public spaces.

●**What challenges are there in the future?**

The next challenge is public art that adds to the attraction of squares, parks and other spaces. It may not be too long before our streets are adorned not only with sculptures and other physical works, but also with new art as a fusion of digital technology.

(Hirose-Tanikawa Lab., The University of Tokyo)

◆Finger Gesture [♫016]

●What type of technology is inside?

Smartphones, tablets and other popular devices are usually operated by directly touching their screens. However, with "Finger Gesture," they can be operated without touching them at all. When the user makes a finger gesture at a device equipped with this technology, the camera fitted on the device will read the gesture. As specific gestures are pre-set to trigger specific actions, the device will act in response to the gesture it has read. Then, because there is no need to touch the screen, the device can be operated when hands are dirty or wet, or when wearing gloves.

●What is the potential of this technology?

This technology could be used to operate various devices including smartphones, PCs and car navigation systems, as well as touch panels for information and guidance in public facilities, etc.

●What challenges are there in the future?

In future, it may be possible to operate household appliances without using operating buttons or remotes, etc., but with finger gestures alone.

(NEC Solution Innovators, Ltd.**)**

◆ MEMS Thermal Sensor [♫017]

●What type of technology is inside?

Conventionally, large and expensive thermography devices are necessary to detect body temperature in order to recognize the presence of a person. This "cat tongue" sensor is a highly-precise sensor for detecting human body temperature utilizing Micro Electro Mechanical Systems (MEMS). It can be embedded into various products such as smartphones and webcams as it is compact and inexpensive. This "cat tongue" temperature sensor is being embedded into smartphones for an easy-to-use experience.

●What is the potential of this technology?

It can also be used in energy-saving household appliances such as air conditioning units to turn on the power whenever a person enters the room, and can also be used to detect abnormal temperatures in machines. Remote monitoring is possible by detecting human body temperature and issuing an alarm if necessary.

●What challenges are there in the future?

As it can detect the temperature of a human hand and read its movements, it can be used to operate computers by using body language.

(OMRON Corporation)

◆Baseball Lab [♫ 018]

●What type of technology is inside?

In Japanese pro baseball, batters have a maximum strike ratio of about 30% (i.e. they hit about three in every ten balls); only about 20 players can top this figure. At the other end, there are about 15 pitchers who can pitch at speeds of 155km or more, and less than 20% of straight pitches at this speed are actually hit.

Pro baseball clubs use these data to provide objectively analysis of ball games, as a vital means of strengthening their players and improving their strategies.

"Baseball Lab" is a site to be enjoyed by anyone and everyone. It includes features like "Data analysis per ball pitched," and "Match result predictions" drawn from computerized match simulations repeated hundreds of times. Analysis and predictions are based on the starting pitcher and expected team members, each player's ability computed from 10-30 years' data, and changes in base status at the end of each inning.

Similar methods of accumulating vast amounts of detailed data then displaying and applying the analyzed results are also used in the J. League (soccer), Top League (rugby), and other sports besides baseball.

●What is the potential of this technology?

Baseball Lab can support the use of data by players and teams, as well as providing fans and media with various data and new ways of enjoying sports, including entertainment contents based on the data.

●What challenges are there in the future?

We aim to gather even more data, increase the accuracy of analysis, and further improve the accuracy of predictions.

(DataStadium Inc.**)**

◆ Multi Sensor Network Module [♫ 019]

●What type of technology is inside?

A subject of great interest today is technology known as "IoT (the Internet of Things)," in which devices themselves exchange information over the Internet. These devices will use sensors to collect various information on light, heat, vibration, etc., and communicate data over networks without human intervention. This technology will make machines work more intelligently, while the gathered data can be used to create new information services. An indispensable part of this technology is the "Multi Sensor Network Module," equipped with various types of sensor as well as a communication function. It is so compact that it can be worn on watches, glasses, etc.

●What is the potential of this technology?

In agriculture, for example, this system could use sensors to gauge weather conditions on farmland, the environment inside greenhouses, and water levels in paddy fields, and manage all of them remotely. The sensors can also be used to monitor and keep a watch over elderly people living in remote locations.

●What challenges are there in the future?

As well as communication between devices, previously unknown intelligence and systems could be created by aggregating the information gathered by devices, then analyzing and utilizing that information as "Big Data."

(Alps Electric Co., Ltd.)

◆ Smile Scan　[♫020]

●What type of technology is inside?

People try to find a range of information each other's expression in an attempt to better understand them. "Real-time Smile-o-meter Measurement Technology" is technology designed to allow machines to identify a person's expression. While technology is available to read facial outlines, these systems suffered from reduced recognition rates depending on the direction a person faced. This technology can read facial expressions quickly and accurately by analyzing overall expressions using statistical recognition methods based on facial image data of thousands of people. Faces are identified from camera images, and facial features such as shape, outer corner of eyes and wrinkles around the mouth are measured in real-time to determined whether or not the person is laughing. There is no need to register faces in advance, and multiple faces can be measured simultaneously.

●What is the potential of this technology?

The system comes with a function to measure how much a person is laughing when taking a photo with a digital camera, and can be used as a smile training support tool in hospitality industry, as well as applied to robots used to identify facial expressions.

●What challenges are there in the future?

Further development of technology that allows machines to acquire various information from people's faces and identifies their expression and feelings will find the ideal match between man and machine.

(OMRON Corporation)

Security

◆ AIR Danshin system　[♫021]

●What type of technology is inside?

With such a large number of earthquakes in Japan, the development of technology that helps minimize vibrations and prevent damage caused by buildings crumbling is extremely important to in order to protect the livelihood of citizens. Instead of trying to minimize or resist vibrations, why not eliminate vibrations altogether by raising the entire house off the ground? The AIR Danshin system was developed with this concept in mind. By applying Pascal's law of "A change in pressure at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid" that is taught in science, a small pressure equivalent to that of a person blowing out air can lift up an ordinary house weighing some 50 tons.

●What is the potential of this technology?

Air from an air tank is discharged approximately 0.5 to 1 second after an earthquake strikes to quickly raise buildings, and reduce vibrations to 1/30th that subjected during a level 7 earthquake on the Shindo Japanese seismic intensity scale.

●What challenges are there in the future?

Installing the system in facilities for the elderly or disabled who are vulnerable when disasters strike, and developing operating methods.

(AIR Danshin Co.,Ltd.)

◆ **Escape guiding system of high-intensity phosphorescent type** [♫ 022]

●**What type of technology is inside?**

A massive earthquake may cause a long blackout, which could happen suddenly during the night. Availvs Aluciall high-luminance phosphorescence evacuation guidance will continuously guide people along evacuation routes to evacuation centers by lighting up for a long time during a blackout at night. The product uses a hard quartz molding board, a highly functional, long-lasting phosphorescent material that continues to give high luminosity all day long. There are no utility fees or maintenance costs as there is no need for power, wiring, fluorescent tubes, or batteries. It is also maintenance free and does not need to be repaired. It complies with JIS Z 9096 (Graphic symbols safety signs - Safety way guidance systems, phosphorescent type), enacted in December 2013.

●**What is the potential of this technology?**

This product provides evacuation guidance during blackouts by continuously providing high luminosity lighting until morning without power. It is highly durable and can work for a long time. It is possible to create an evacuation guiding system almost anywhere, including on walls and floors, indoors or outdoors, and in wet areas. It can be set up to guide people from indoors to outdoors or vice versa over large areas.

●**What challenges are there in the future?**

We aim to save lives by installing this evacuation guidance system worldwide to guide people to safety.

(DOPPEL CO.LTD.)

◆ **DONET（Dense Oceanfloor Network system for Earthquakes and Tsunamis）)** [♫ 023]

●**What type of technology is inside?**

Kumanonada off the Kii Peninsula coast is the hypocentral region that will trigger the Tonankai and Nankai trough earthquakes that are expected to strike with a high level of certainty in the near future. Instruments such as a strong motion seismograph, wide-area seismometer, crystal water-pressure gauge, minute differential manometer, hydrophone and precision temperature gauges have been installed on ocean floor in the area at a depth of between 1900 and 4300 m. These instruments are connected with a cable to form a networked observation system dubbed "DONET." This system can detect a range of different movement in the ocean floor accurately, including subtle movements in the earth's crusts to major earthquakes. While seismometers installed on land take time to detect earthquakes with an epicenter located on the ocean floor, DONET installed near seismically active areas can detect earthquakes up to 10 seconds faster than on land.

●**What is the potential of this technology?**

As the system detects earthquakes faster than on land, information such as updates and warnings can be sent before earthquakes or tsunamis strike cities where people live.

●**What challenges are there in the future?**

Movement in the earth's crust will be monitored over a longer period of time to help analyze and research the mechanism behind earthquakes. "DONET2" is also being planned with 29 devices to be installed in nearby coastal areas.

(Japan Agency for Marine-Earth Science and Technology)
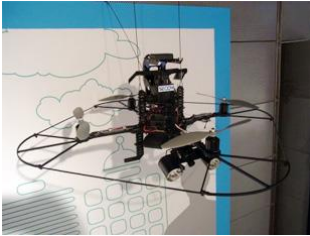
◆ Flying surveillance robot [♫ 024]
●What type of technology is inside?

This compact, independent flying monitoring robot has been developed with security camera image analysis technology and personnel tracking technology honed by Secom over the years with the aim of providing security solutions over a wide area. When security systems detect abnormal conditions, this robot rises similar to a helicopter, flies independently to the particular site and identifies detailed information quickly. In addition to approaching trespassers, identifying facial features and taking photos, the number plates of escaping cars can be taken and sent to the control center. For safety reasons, the robot only flies within designated sites, and is designed to maintain a set distance from people and vehicles.

●What is the potential of this technology?

Shopping centers and factories can cover vast areas, which makes it difficult to monitor with fixed security cameras alone. The robot provides a feed of detailed information on trespassers that cameras cannot cover.

●What challenges are there in the future?

Battery longevity is being increased and further improvements are being made to tracking capabilities for trespassers and vehicles with the aim of commercialization by 2015. (SECOM)
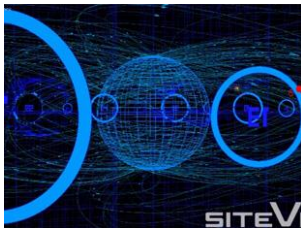
◆SiteVisor [♫ 025]
●What type of technology is inside?

SiteVisor is a system that detects cyber attacks and other malicious communications or access over networks. It is based on the cyber attack alert system developed by the National Institute of Information and Communications Technology (NICT), a public research body.

When communicating over networks, the IP address assigned to each PC or communication device is used as the receiving address. Many communications arriving at unused IP addresses are sent by malicious programs or malware. By monitoring normally unused IP addresses (known as the "Dark Net"), SiteVisor finds and reports malicious communications.

●What is the potential of this technology?

The system can quickly detect whether there has been malicious access from outside, or whether the user's device has been infected by a virus and is engaged in malicious communication. This makes it possible to take corrective action more quickly.

●What challenges are there in the future?

There are various other methods and systems for protecting networks. SiteVisor has been developed for easy linkage with other security systems, enabling networks to be used more safely.

(clwit, Inc.)

◆ Moverio [♫ 026]

●What type of technology is inside?

"Moverio" smart glasses are wearable terminals that are as simple to wear as ordinary glasses. A large screen equivalent to a maximum 320 inches appears 20m ahead of the viewer, opening up a new world of enjoyment provided by video and apps.

Because the "lenses" of the glasses are transparent, the projected images appear superimposed on the real field of vision.

On the right and left arms of the glasses are a small liquid crystal panel (0.42-inch TFT color LCD panel) and a photo-optic unit developed from the optic technology accumulated in projector development. Projected images are reflected in the transparent part corresponding to lenses and guided to the eyeline, and images are projected in full color (16.77 million colors) onto the semitransparent mirror layer in front of the eyes.

●What is the potential of this technology?

As well as big-screen visuals, the unit is also equipped with various sensors including a GPS function, gyro, accelerometer and geomagnetic sensor. With these sensors , the user can also enjoy games and other apps incorporating AR (augmented reality) technology, in which video images are superimposed on the actual field of vision.

●What challenges are there in the future?

Moverio is expected to be used not only by individuals but also for business and public interest purposes. For example, we have carried out demonstration tests on a disaster prevention response system in a joint effort between Epson and the National Institute of Information and Communications Technology (NICT) *1.

In this system, a small unmanned drone fitted with a camera flies over a disaster area filming aerial images. The images and information on the location are forwarded to rescue workers at the disaster site in real time, using NICT's wireless technology. Besides this try , demonstration tests are underway on various business uses.

(Seiko Epson Corporation/Epson Sales Japan Corporation/National Institute of Information and Communications Technology)

Energy
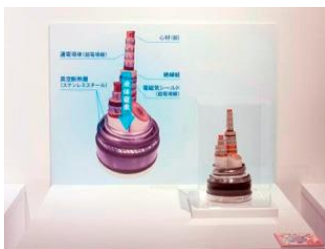
◆ superconducting power transmission[♫ 027]

●What type of technology is inside?

When electricity generated at power plants is supplied to households, part of is lost during the process. This is called transmission loss, and is where electrical resistance generated during transmission causes electrical energy to change to heat and escape.

Today, 4.8% of electricity generated in Japan is lost due to transmission loss. To combat this issue, power transmission cable that applies superconductive wiring technology is being used. The electrical resistance within the superconductive cables is zero, which means electricity can be supplied without any transmission loss and wasted electricity.

●What is the potential of this technology?

The efficiency of electrical power supply increases dramatically between power plants and urban areas with a high electrical consumption, leading to reductions in CO2 and fossil fuel consumption. Transmission loss usually increases in proportion to distance, however power can now be transmitted long distances without needing to consider transmission loss.

●What challenges are there in the future?

Stable superconductive power transmission and transmission of electricity over long distances should be established as part of future goals for power production plans on a global scale.

(Sumitomo Electric Industries, Ltd.)

◆ Offshore Wind Power Generation [♫ 033]

●What type of technology is inside?

Wind power generators have been noted the type of renewable energy technology that is capable of generating large amounts of power at a low price. Yet in Japan, where mountains cover 70% of the country, there is minimal land where wind power generators can be installed. If generators can be installed on the ocean, then the situation would be much different. To address this, technology has been developed to install automatically controlled wind power generators on the ocean. Experimental research is currently being conducted for a 2,000 kW class generator approximately 3.1 km off the coast of Choshi in Chiba Prefecture. The blades of the giant generator standing in the ocean are able to make full use of the wind blowing in the area, and have a diameter of approximately 92 m.

●What is the potential of this technology?

Japan's long coastal regions and vast offshore areas drastically increase the areas where generators can be installed, and expand the potential of wind power.

●What challenges are there in the future?

The world's largest wind power generator with blades of a 160 m diameter is currently under development. Reliability and toughness will be further increased with the aim of lowering power generation costs even more.

(NEDO /Fukushima offshore wind consortium)

◆ Next-generation bio-fuel cell [♫ 028]

●What type of technology is inside?

Fuel cells are the next generation clean batteries using oxygen and hydrogen. There are two types of batteries: disposable primary cells such as alkali batteries and rechargeable secondary batteries such as lithium-ion batteries that are used in mobile phones. Fuel cells do not belong to either type as it is a device that can produce electricity using hydrogen and oxygen electrodes. Various types of electrodes have been developed in search of better electric efficiencies because the type of electrode affects the amount of electricity that can be produced. While aiming at developing an environmentally-friendly fuel cell, we were able to create a low-cost disposable battery without waste by using collagen, a biological material, in fish scales, the main ingredient.

(Setsunan University, Supported by Nitta Gelatin Inc.)
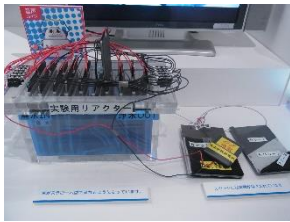
◆ **Microbial fuel cell** [♫029]

●**What type of technology is inside?**

The activated sludge process is currently used as a method for treating wastewater. This processing method makes use of aerobic microorganism decomposing organic matter with aerobic respiration, but consumes immense amounts of energy to supply oxygen. Research and development is being conducted into power generation technology using microbes that grow in sewage or factory wastewater. This microbial power generation technology uses microbes that generate electricity (power generating bacteria) when they decompose organic matter, which was identified recently, to treat wastewater. This means wastewater can be treated while also generating power, with efforts being made to construct treatment plants for simultaneously treating wastewater and generating power. (NEDO)

◆ **bio jet fuel from euglena** [♫030]

●**What type of technology is inside?**

When considering the future global environment, as well as CO_2 emissions, development of fuel sources that do not rely on fossil fuels is essential. The use of biomass seems to be the only current method available to reduce CO_2 emissions, and the same applies to aviation fuel. One type of fuel that uses biomass is produced by fermenting corn or sugar cane to create bioethanol as a substitute for gasoline. Yet there is an issue with using food ingredients as the source to produce fuel as it competes against food production. One idea being considered to combat this is to use oil that has been extracted from Euglena, a type of algae, as the fuel source. Growing large quantities of algae to produce fuel allows biofuel to be generated without competing against food ingredients.
(euglena Co., Ltd.)

◆ **RITE Bioprocess** [♫031]

●**What type of technology is inside?**

Use of biofuel, which uses renewable biomass (plant-based resources) as energy sources, is increasing. Biofuel is generated by fermenting food ingredients such as corn and sugar cane, however there are concerns that increased use will lead to food shortages. Thus there is a high potential for using non-edible parts of plants as fuel. Yet when using existing microbes to try and ferment leaves, stalks or other non-edible parts, growth inhibiting substances are secreted, leading to a problem where growth of microbes required for fermentation becomes inhibited. The "RITE bioprocess" features a genetically modified coryneform group that encourages growth without fermentation, which has successfully created biofuel efficiently without being affected by growth inhibiting substances. Produce that is discarded without being eaten can be used efficiently as a fuel source.
(Green Earth Institute**)**

◆Hydrogen Society [♫ 034]

●Vision for development

These problems of the global environment and problems of energy and resources can be solved at a stroke by the ultimate clean energy of hydrogen. Hydrogen has the potential to become an important energy in society, in the same way as electric power and heat are now.

There are four reasons why hydrogen is so promising.

The first us that our planet has an inexhaustible supply of hydrogen in water and compounds. The second is that it is very powerful – so much that it is used to fuel space rockets. The third is that it reverts to water after combustion, thus emitting no CO_2 or atmospheric pollutants. And the fourth is that electricity, which cannot be stored in bulk, can be stored, transported and used in the form of hydrogen as a fuel in fuel cells.

When hydrogen is used broadly, not just as a fuel in eco-cars but also as a source of energy for offices, homes and factories, we will be able to build a low-carbon society.

Technology Studio
– Experience the world of the future –

What products or services will be created by today's advanced technology and play a part in our lives and society ten years from now? Questions like this are addressed in this hands-on section.

◆Sota [♫ 035]
●Vision for development

Japan has made remarkable advances in research on robots, and in recent years attention has been focused on the development of talking robots. So far, however, there have been no robots with a natural "sense of conversation" as found in dialog between humans. Sota has been developed as a robot that can communicate naturally with people in their daily lives.

● Technical description

Sota was developed with the aim of creating a table-top talking robot that can relate to and live with people. As well as its lovable, friendly character design, free body move ments and smooth conversation, Sota gives a strong sense of dialog through conversations with other robots and interactive responses to conversation partners. Meanwhile, anticipating use in ordinary homes, we have made the robot smaller and quieter, with a simple mechanism and safe design to ensure no fingers are caught. Equipped with a camera, microphone, speaker and other communication functions as well as a network connection capability, Sota can be not only a conversation partner but also useful in a wide range of daily life support, including distance learning and monitoring health.
(Vstone Co.,Ltd.)

◆ Time slice view [♫ 036]
●Vision for development

In entertainment media, such as movies, which take a long time to make, it is possible to create dynamic image expressions by synthesizing images which are captured from different angles, image synthesizing has been a rather difficult process, in sports coverage on the TV for example, as image processing is time consuming and requires large equipment, and it has been impossible to realize the process when there is not enough time between filming and broadcasting. Created to solve the problem is "Time Slice View".

●Technical description

"Time Slice View" is a multi-view, robotic camera system that involves multiple high definition cameras which are linked together. For example, high definition cameras can be set up around a basketball net. The images of a subject captured by the respective cameras are integrated to form an image so that while the subject freezes for a split second, the viewpoint rotates around it. A computer automatically processes a selected frame so that the image rotates smoothly around the subject when generated. By this method, dynamic image expressions are achieved during programs which allow a short period of time for image processing. The recent development enables several robotic cameras to capture images of a moving subject simultaneously in a chasing manner.
(Japan Broadcasting Corporation)

◆ OLED Lighting　[♫ 041]

●**Vision for development**

The light of organic EL lighting is similar to natural light and has a natural-looking color. This light makes it easier to see skin color and the true color of cosmetics, making it suitable for use when applying make-up. "OLED Lighting," born of a collaboration between Pioneer and Shiseido, offers variable color as well as brightness and can express a variety of light conditions. As such, it is useful when applying make-up to suit different situations.

●**Technical description**

Organic EL lighting is based on the principle that certain organic substances emit light when charged with electricity. It emits light in planes rather than single points, thus causing less glare and creating a light that is kind to eyes. Pioneer's organic EL lighting has a unique RGB stripe structure, and the RGB light emission levels can be adjusted individually. This means that lights of various colors besides white light and different situations can be reproduced.

　OLED Lighting is more energy-efficient than conventional lighting fixtures and also reduces CO2 emissions. It uses no toxic substances such as mercury, emits less heat, etc., and is promising as next-generation lighting, from the viewpoint of environmental concerns.

(PIONEER CORPORATION／Shiseido Co., LTD.)

◆ Real-Time Pulse Monitor Using Facial Imaging　[♫ 042]

●**Vision for development**

Pulse, blood pressure, body temperature and other similar readings are key indicators for understanding health conditions. Yet measurement requires specialized equipment, and wearing them can lead to stress, with some people even forgetting to take measurements. Technology has been developed that allows these measurements to be taken using smartphones, tablet devices or computers that the majority of people use, without having to wear specialized equipment.

●**Technical description**

The developed technology automatically measures pulse from facial images taken with integrated cameras or web cameras connected to smartphones, tablet devices or computers. This works by using the characteristic that hemoglobin contained within blood absorbs green light. This means that the amount of green color in a face changes slightly depending on fluctuating blood flows with the pulse. The change in color cannot be seen with the naked human eye, however these changes are used to detect the pulse. The camera automatically measures the pulse while the person is working looking at their computer screen, which means their health can be monitored without even thinking.

(FUJITSU LABORATORIES LTD.)

◆ **THE PLAY ROOM** [♫ 037]

●**Vision for development**

"Playroom" is a PS4™ play space created by a PlayStation® Camera. It was developed to enable users to touch and play with mini robots around them, to play air hockey in a 3D field, or to enjoy magic tricks with everyone. It uses augmented reality (AR) technology to analyze by computer real-world images captured by camera and to experience virtual reality by overlapping CG images.

●**Technical description**

Various approaches have been developed to make users feel they are really playing with a so-called ARobot. From the camera image, the position of the human face and body movements are analyzed as well as various information mounted on a wireless controller called DUALSHOCK®4. This information is transmitted to the artificial intelligence (AI) system in the ARobot, which will jump up as if it is interested in the user's movements. The images of the camera and the ARobot are combined using computer graphics as if it is playing together. Through the controller, you can hear vibrations and noise as if you are living inside the ARobot.

(Sony Computer Entertainment Inc.)

◆ **Scritter** [♫ 038]

●**Vision for development**

Conventionally, it is impossible to switch subtitles on movie screens during lecture presentations. We have developed a "scritter", a multiplex screen system in which the user wears a pair of glasses to see two types of information simultaneously on the same screen.

●**Technical description**

Existing 3D displays show two images: the horizontal and vertical polarizations. A 3D image can be seen by wearing a pair of polarized glasses where the vertical light is seen by the right eye and the horizontal light by the left eye. The two images overlap when looking at the screen without glasses. With scritter, the images are overlapped with an information process where one image is hidden when looking at the image without glasses, but can be seen when wearing polarized glasses. Different information can switch around by putting on and taking off the polarized glasses.

(Kanagawa Institute of Technology Shirai Lab.)

◆ Cloud based Home Vegetable Factory [♫ 040]
●Vision for development
The plant factory was developed for producing food to help solve food problems caused by climate change such as cold summers, warm winters, and typhoons and damages by pests. The network-type home-use plant factory was jointly developed by Panasonic Corporation, Mitsui Fudosan Co., Ltd., Chiba University, and Mirai Co., Ltd. It highlights the issues that need to be solved in order to use this technology. We are trying to increase interest in this system among residents.

●Technical description
The home-use plant factory is designed to be part of the room and furniture, and thus is truly for home use. The main feature is a network connection that adds value to the plant factory. A built-in camera can be used to check plant growing conditions such as lighting, temperature, nutrients and CO_2 with specialists. As the cultivating conditions can be checked from a distance, it can offer appropriate solutions according to the environmental situation. We are also studying the opportunities and effects of revitalizing regional communities by exchanging vegetables and sharing recipes through a website.
(Panasonic Corporation)

◆ OriHime [♫ 039]
●Vision for development
There are many people in the world who suffer from loneliness because they cannot see friends living far away or cannot leave hospital due to prolonged illness. Having a clone who can travel on your behalf or who can be a friend can bring peace of mind. OriHime is a robot that can make these dreams come true using information and robotic technologies.

●Technical description
"OriHime" contains a webcam, speaker, and directional microphone which can share the information that it collects and the sounds it records to a personal computer or tablet. As its neck can be moved by a remote controller, it can see everything around it. For example, a child in hospital can leave OriHime at home and use it to talk with his or her family. OriHime does not show emotional facial expressions but the face is based on a Noh mask and can sense the expressions of surrounding people from the tone of voice and movement.
(Ory Laboratory)

◆ Seismic Isolation Systems [♫ 043]

●**Vision for development**

In Japan, a country prone to large earthquakes, all objects, all information, and all lives are permanently at risk of an earthquake. Accordingly, earthquake measures to protect society are essential. This seismic base isolation frame prevents buildings from vibrating during earthquakes.

●**Technical description**

Three main technologies are used to protect buildings against earthquakes: earthquake resistance technologies, damping, and seismic base isolation. Seismic base isolation, the most effective technology for controlling the shaking of a building, prevents the earthquake from being directly transmitted to the building. This is done by installing a device below the building to decouple it from the ground. The seismic base isolation frame supports the building and absorbs vibrations by using an LM guide, which diverts the vibration, and a ball screw that converts the vibration from direct movement to rotational movement.
(THK CO., LTD.)

◆ Kagura [♫ 044]

●**Vision for development**

Kagura is a "next-generation instrument" app that lets you play music just by moving your body in front of a PC camera. It requires no experience of playing an instrument. Kagura has been designed to avoid dissonance, so that anyone can feel good playing music just by moving their body as their inspiration takes them.

●**Technical description**

Based on patented technology for analyzing motion and creating music, Kagura enables the user to produce "sound" just by moving the body, without holding or touching anything. Although it can be used with ordinary webcams, an upgraded version supports Intel's "RealSense," a 3D camera that can read depth. With this device, the user can change tempo and make other operations by gestures alone, opening up even more possibilities. The performance can be recorded and uploaded to video playback sites.

Kagura is available as free software, and can be downloaded from the official site (www.kagura.cc).
(SHIKUMI DESIGN, Inc.)

◆ Manga Generator [♫ 045]

●**Vision for development**

What if you could jump into a manga and be with your favorite hero and adorable characters! Manga Generator realizes this dream. Regardless of culture, language, age, and number of people in the group, anyone can intuitively join and enjoy this system, which was developed as an enjoyable communication entertainment system.

●**Technical description**

Manga Generator uses motion capture to read the movements of people by linking with a camera. You can enter the world of manga and make up the story as you go along. The system adjusts the balloon to where the person is located and where the text should be displayed and can go into the manga without feeling out of place. It reads the emotions from both elbows, both armpits, and the location of the backbone, and displays the background accordingly. You can evaluate the finished manga and enjoy it.
(Kanagawa Institute of Technology Shirai Lab.)

◆ Substitutional Reality system [♫ 046]

●Vision for development

At times we may have doubts about something, but try to make it sound plausible by thinking that it was a mistake. Or perhaps we may see a mysterious dream but believe that it was real. It is important to analyze the higher cognitive functions to study the brain in these situations. The Substitutional Reality System (SR System) was developed to artificially create and study these types of experiences more easily.

●Technical description

The "SRSystem" helps experience what we are seeing as if it were real by combining the current images with past and unreal images. By displaying 180º images or switching the past and real images smoothly using the head-mounted display, the user can imagine that things seen in the past are actually happening. With this technology, we hope to gain a better understanding of the functions of the human brain by studying the body and mind at the same time as the image.

(RIKEN)

◆ Edel Sunaba [♫ 047]

●Vision for development

Sandboxes are among the favorite places for curious children to play. If only we could devise a safe and hygienic sandbox that would stretch children's creativity and bring more excitement to their play… That was the idea behind the development of "Edel Sunaba." By using sensors to read the topography of the sandbox, then projecting images there by projection mapping, we have transformed a mere "sandbox" into an original "play space."

●Technical description

Edel Sunaba uses a special polymerized sand called "Edel Sand" (kinetic sand). Its unusual fluffy and glutinous texture makes it fun to play with, and because it hardens without water, children can create whatever shapes they like. It also uses Kinect distance sensors developed by Microsoft to read the topography and contours of the sandbox, then projects colorful images and images of seasonal insects onto it. The colors change and insects react to changes in the shape of the sand, hand movements and other stimuli, making for endless fun. Children will want to play forever with this "sandbox of the future."

(SEGA Interactive Co., Ltd.)

◆ Digital Catalogue [♫ 048]

●Vision for development

It is necessary to learn how to use a mouse, keyboard, and buttons, as these input devices are not intuitive. With touch displays, however, smartphones and tablets are now highly intuitive.
This digital catalogue takes one step further and can produce displays on large screen panels for billboards and digital signage.
It realistically displays the natural movements of human beings.

●Technical description

By displaying the information with a projector on a large screen, it can be combined with motion sensors such as Kinect and Leap Motion, which can read people's movements.
The information on the screen can be changed by a simple action of holding, swiping, and tracing the screen with your hands.
(Ricoh Company, Ltd.)

◆ VIRTUAL FITTING [♫ 049]

●Vision for development

You may feel like choosing clothes with a color that suits you, but find it takes too long or never have the time to try them on. This type of inconvenience or lack of satisfaction can be resolved using AR (augmented reality). Introducing "Dress-up Display", designed to make shopping more enjoyable.

●Technical description

"VIRTUAL FITTING" comprises a large display, tablet device and a camera. The camera first captures an image, and automatically identifies the clothes being tried on. Next, the user selects their favorite color, and sections of clothes with that color are converted with the computer. By displaying this in real-time on the monitor, the system superimposes clothes with the user's favorite color over the image of the user. The display can be linked to computers, smartphones, tablet and other devices, and shared with friends and family who may be located somewhere else.
(Dai Nippon Printing Co., Ltd.)

◆ The Environmental Island GREEN FLOAT [♫ 050]

●Vision for development

Green Float is an eco-friendly futuristic city concept that aims to create a new affluence, in which people can live together in good balance with ecosystems while protecting the natural environment.
Making maximum use of natural forces at the equator, the city will house a futuristic new environmental society that will use 100% natural energy, be self-sufficient in food, and convert waste into resources and energy.

●Technical description

Green Float is a futuristic city that combines the two innovative themes of a "botanical city" (Green) and a "marine city" (Float). This floating island city will be built in the Equatorial Pacific, an area relatively untroubled by tsunamis and typhoons. A 1,000m high-rise tower in the center of the island will be ecologically designed to make maximum use of sunlight. The residential space at the top of the tower will be kept at a comfortable year-round temperature of 26 to 28 degrees centigrade, even at the equator. Recyclable magnesium alloys obtained from seawater will be used as construction materials, while space-based solar power generation and other new technologies that emit no CO_2 will be used for electricity. Plant factories making maximum use of sunlight and mariculture farms producing the blessings of the oceans will provide self-sufficiency in food, and biodiversity will also be protected.
(SHIMIZU CORPORATION)

Japan Manufacturing [♫ 051]

◆ 3DPrinter

3D printer is the equipment by which actuality can complete the three-dimensional plan made on the computer just as it is. Large enterprise was using it for sampler making from the front for more than 30 years as technology, but software and price reduction of a 3D printer could also introduce small and medium enterprises and an individual for these several years.

To make with adding the conventional material, not the way to shave and pour into the style as directionality of the spread of a future 3D printer, something with the shape that it couldn't be made so far can be done now. Possibility as the value-added equipment that an end product as well as a sampler could also be made now. The free software which hangs a 3D plan sensuously also spreads, and there is a possibility of the personal use it became possible a work is shared on the internet, and to output that a person of all over the world took out and made an idea.

◆ CNC(Computerized Numerical Control)

A machine tool will be reduced to the shape I'd like to process while moving the tool to process it to processed goods.
The, how long to move a tool digitizes the distance and a point, controls a motor by a computer and calls the equipment

which operates a machine as it CNC equipment to make it the shape I'd like to process.
 CNC equipment can also control the speed when moving a tool.
When there are no machine tools, it can't be made with a car, an airplane, a railroad and something closer to produce a cellular phone, a camera and a clock. The one controlling the machine tool is CNC, and I'm being used by the whole world and am supporting "manufacturing of the world" today.
(FANUC CORPORATION)

◆ Fully Automatic Squid Fishing Machine

With an increasingly serious shortage of successors in the fishing industry, the "Fully Automatic Squid Fishing Machine" has succeeded in making squid fishing fully automatic based on computer control, causing a revolution in squid fishing.
Using this system, a single operator can control up to 64 squid fishing machines from the bridge of each fishing boat. As well as the increased efficiency this provides, we have also succeeded in digitizing the fishermen's skill known as "*shakuri*" (jiggling the bait) and controlling it by computer.
Meanwhile, various problems that occur at sea can now be minimized by using sensors to monitor the swaying of the boat due to changes in weather conditions and tidal currents, and automatically controlling the motion of the squid fishing machines.
(Towa Denki Seisakusho CO. LTD.)
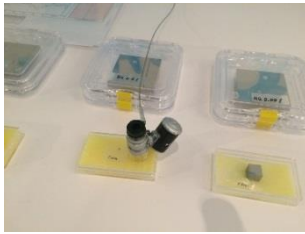
◆ **1-Nano Roughness Super Precision Polishing Technology**

Product surfaces sometimes need to be processed until they are smooth to help them perform to their best potential. This is particularly true of precision components, optical system components and others built into semiconductor manufacturing devices and electronic equipment, where very high-precision processing technology is required.

TDC Corporation's ultra-precision mirror processing technology reduces the polishing thickness in each processing action to infinitesimal amounts. This makes it possible to polish to ultra-precision levels, namely a surface roughness of Ra = 1nm (Ra: standard average parameter for surface roughness, 1nm=0.000001 *mm*) or less, for various materials including metals, ceramics, semiconductors and plastics. As well as flat surfaces, it may also be used on curved, spherical, cylindrical, foil, and pipe inner surfaces. This high-precision processing technology is used in a wide range of fields including automobile element technology development, medical devices and aerospace components.
(TDC corporation)
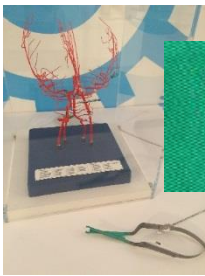
◆ **Sugita clip**

Clipping surgery for cerebral aneurysms is undertaken as part of subarachnoid hemorrhage treatment, as well as treatment for cerebral aneurysms caused by subarachnoid hemorrhage, a cerebrovascular disease with a high mortality rate. Subarachnoid hemorrhage occurs when aneurysms or lumps that form inside cerebral blood vessels rupture.

When subarachnoid hemorrhage has occurred or aneurysms at risk of rupture are discovered, surgery must be carried out to open the cranium, close the base of the aneurysm, and ensure that no blood flows into it.

The Sugita Clip was specifically designed for use when closing the root of these aneurysms. Since 1976, when it was invented by neurosurgeon Dr. Kenichiro Sugita, 134 different types have been developed.

The latest of these tools is the "Sugita Titanium Clip II." It has a wide opening width and thus can be used flexibly during surgery. On the other hand, it can firmly grip even the finest blood vessel with reliable closing force. It is made of titanium alloy, a material with excellent biocompatibility and durability. Unlike iron and other metals, titanium is not affected by magnetic fields and does not impact magnetic resonance imaging (MRI) scans.
(MIZUHO Corporation)
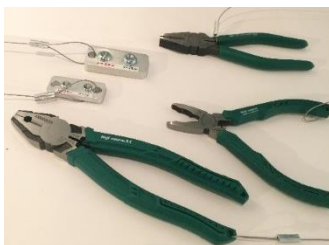
◆ **Neji-Saurus (Screw Removal Pliers)**

Neji-Saurus pliers are specially designed to remove stubborn screws easily and with the minimum of force. They could be screws with damaged heads that no longer respond to a screwdriver, or screws that have rusted in place. While ordinary pliers only have horizontal serrations on the inside of their jaws, Neji-Saurus has vertical serration. This serration gives it the strength to grip screws tightly with its jaws and unscrew them.

The slits formed in the vertical serrations are designed not to slip even when removing low-head screws, based on the "Comaneci angle" that produces strong frictional force against the screw being gripped. This technology was developed by Engineer Inc. and is protected by an international patent.
(ENGNEER INC.)

◆ Amaike Super Organza

Weighing just 5g/m², the lightest "Amaike Super Organza" is a thin fabric for high-class fashion that feels like wearing air. Its lightness and thinness have been achieved by using very fine polyester and nylon yarn of 7 and 5 denier. If woven together with silk (14 medium), it creates a soft, moist.

texture; if combined with ultra-fine stainless steel (24 μm), it acquires a unique metallic luster and creased feeling. These are just two of the many possible combinations of fabrics to create new expressions. "Amaike Super Organza," with its many possible textures and design ideas using dyes, etc., is highly respected in the fashion world. It is used by famous European brands as well as the Milan and Paris collections
(Amaike Textile Industry co., Ltd.)

◆ Polarized Lens

Polarized lenses reduce glare by using a film interspersed between lenses to suppress diffuse reflections of light. To create a lens that would be kind to eyes and low in fatigue, the Hopnic Laboratory needed to find ways of controlling light entering the eye. It started by hand-crafting the machinery needed for creating polarized film, and eventually produced the technology for turning this film into a lens.

Hopnic then succeeded in developing a thin, light lens using its original technology. This technology involved inserting polarized film with a thickness of 40μm uniformly into plastic resin with a high refractive index (strong ability to refract light), and forming the lens without creating air bubbles. The company boasts the world's largest share (90%) of high refractive polarized lenses for correcting vision, and its products are used by major lens manufacturers in Japan and abroad.
(HOPNIC LABORATORY)

◆ Coating Device　Granulation

The taste and smell of most medicines would make them difficult to swallow. That is why they are made into tablets and covered with sugar or other coating to make them more palatable. The technology for coating these medicines thinly and uniformly, and the technology for granulation (creating tablets from powders) so that they dissolve with the desired timing, depend on intricate design and advanced knowhow.

These technologies are used in the manufacture not only of drugs but also of gum, chocolate, instant foods and others. Various devices have been developed to suit colors, shapes and coating ingredients. We have the largest domestic share in granulation and coating devices for medical drugs.
(Freund Corporation)

◆ **Large Acrylic Panels for Aquariums**

If we wanted to create an aquarium where we could see 10m-long whale sharks swimming and eating at leisure, we would need a massive tank measuring several tens of meters. This would be impossible with the glass tanks conventionally used in aquariums. However, these large acrylic panels enable us to show "what it's like to be in the water." With our own unique lamination and joining technology, there is no loss of strength or transparency however many layers are overlaid. We overlay 8.5m tall, 3.5m wide, and 3-4cm thick acrylic panels to the appropriate thickness, then join them at the sides to create a massive panel. The panel thickness is calculated from factors such as the required size and shape of the tank, the water depth, etc., based on a deflection rate that enables the fish swimming inside to be seen clearly without distortion. These panels are currently used in the Churaumi Aquarium in Okinawa, and in the "Zhuhai Chimelong Ocean Kingdom" in China, recognized by the Guinness Book of Records as the largest in the world.

(NIPPURA CO, LTD.)
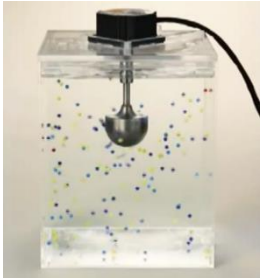
◆ **M-Revo®**

When mixing liquid substances, a blender shaped like an aircraft propeller is normally used. "M-Revo" is a blender with a completely new shape, achieving highly efficient mixing. Inside the hemispherical spinner (central section) is an L-shaped channel for liquids to flow down. When the spinner is rotated inside a liquid, centrifugal force acts on the discharge outlet of the flow channel, causing the liquid inside the channel to be discharged. As the liquid is discharged from the channel, more liquid is sucked up through the channel inlets at the bottom, while at the same time a whirlpool-like eddy current is formed. This current generates a "push→pull" flow that converts the discharge force to a whirlpool-like suction flow, making it possible to blend liquids efficiently.

Blending with "M-Revo" reaches the corners and inaccessible parts of containers. Unlike conventional blenders, there are no rotating blades and therefore no risk of scrapping the container and creating waste.

(EDDYPULS CO.,LTD)

Technology Lab(Experiencial Learning Space)　　　　[2nd floor]

– Robot principle experience–

A basic technology of various robots is introduced.
It's possible to move and experience it actually.
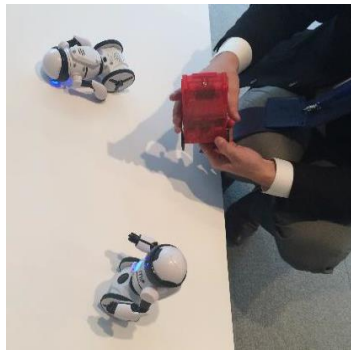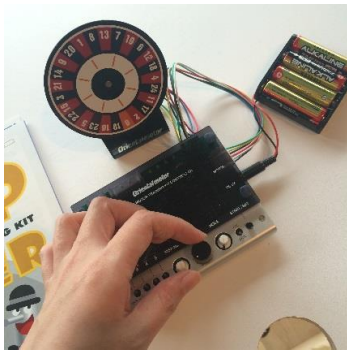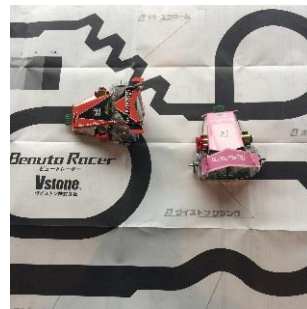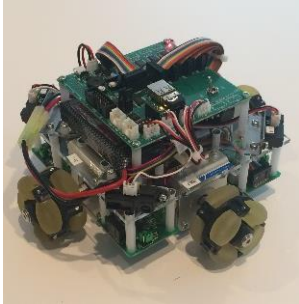
– Video library–

You can freely watch high tech pictures related to the exhibition items of TEPIA at a video library.