

# Integrated Report 2019

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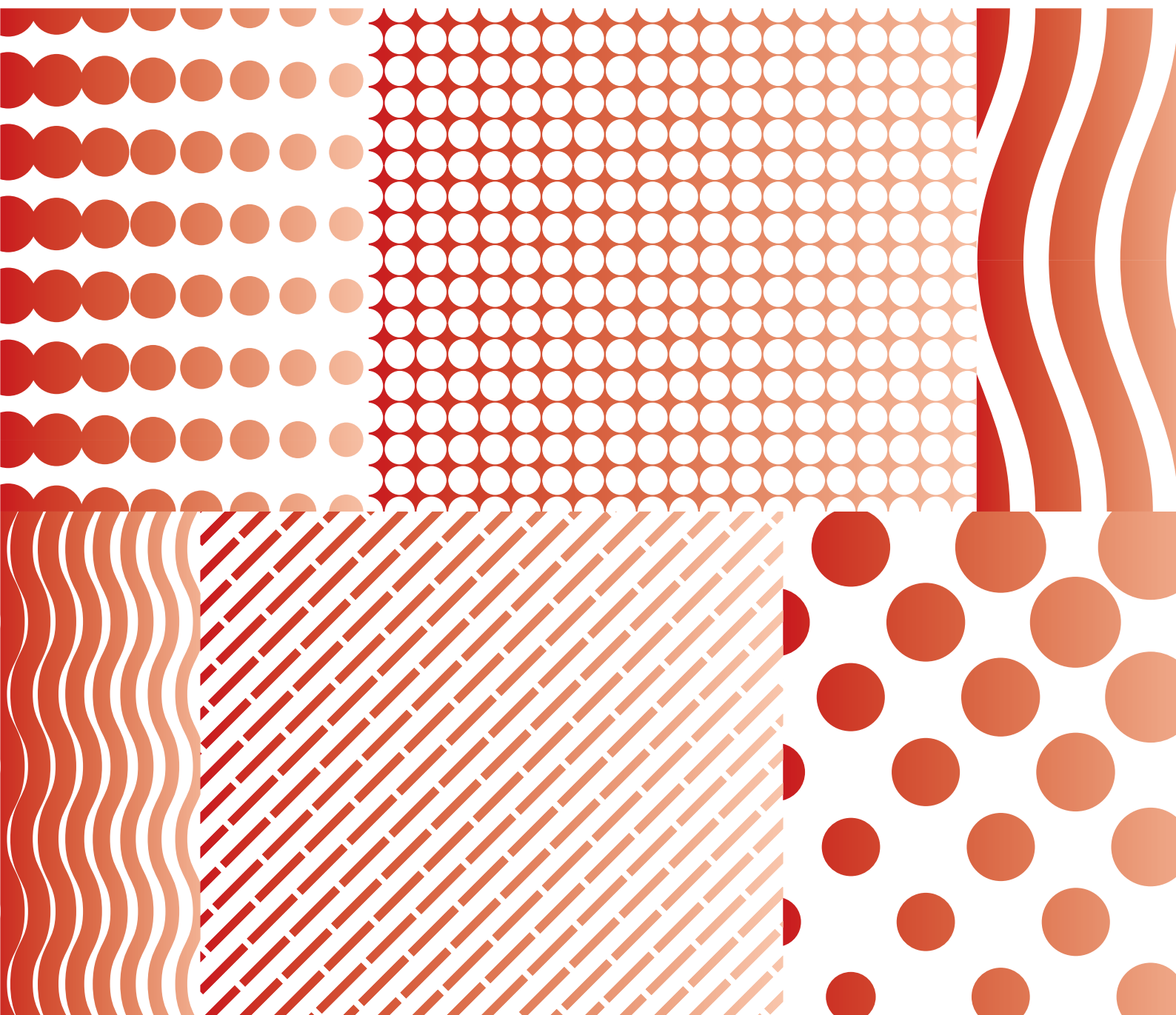


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Editorial Policy

Hamamatsu Photonics published the Integrated Report 2019 as a medium to share mid-to-long term value creation through both financial and non-financial information. The International <IR> Framework provided by the International Integrated Reporting Council (IIRC) and the Guidance for Integrated Corporate Disclosure and Company-investor Dialogue for Collaborative Value Creation provided by the Ministry of Economy, Trade and Industry were used as reference in preparing this integrated report. Our corporate website also includes even more extensive and detailed information. Please read the Integrated Report 2019 together with the information on our website.

Reporting Organization

The Integrated Report 2019 focuses on reporting of non-consolidated information about Hamamatsu Photonics (non-consolidated). The scope of the financial information encompasses 24 companies (as of September 30, 2019), including Hamamatsu Photonics K.K., 19 consolidated subsidiaries, and 4 entities accounted for using the equity method.

Reporting Period

The reporting period for this integrated report is FY2019 (October 2018 to September 2019).



Management Philosophy of the Hamamatsu Photonics Group

We pursue the unknown where no one has yet explored.  
By leveraging photonics technology to establish new industries  
and reach for the world's highest levels of manufacturing excellence,  
we build enterprise value and contribute to the development of science and technology.

Light is a fundamental technology that supports various industries,  
and further advances in photonics technology are required on a global scale,  
to achieve technological innovation today and to improve the performance and accuracy of electronic equipment in the future.  
However, only a small fraction of the nature of light has been elucidated.  
We explore fields not yet explained. Based on the knowledge generated by that inquiry,  
we enhance our enterprise value by discovering practical applications with which to create new industries  
and expand our business operations.

At the same time, we have a duty to generate a stable earnings base  
and continuous growth on which a long-term development of technology depends.  
To respond flexibly and quickly to the expansion of the photonics industry and to changes in the business environment,  
we have formed a framework for the proactive investment in R&D and equipment for continuously stable and high earnings,  
based on our medium-to-long-term vision.

In addition, we believe that people, technology and knowledge are the foundation of sound management.  
We improve ourselves everyday through our work, discovering the things that only we can do.  
In so doing, we conduct technology development which is backed up by the knowledge,  
needs and competitive technologies for building the photonics industry.  
We believe it is vital that we, guided by a mind of “Wa” \*,  
foster a corporate culture that can combine our individual talents to form  
a whole that is greater than the sum of its parts.  
At the heart of this, effort is a bottom-up operational approach that is focused on the workplace.

\*“Wa”: means collaborative spirit and integration of diversified talents.



# To Our Stakeholders

- To everyone who is pursuing and revealing the possibilities of light together -

People often say Hamamatsu Photonics is not an ordinary company. Such uniqueness is our strength. Since the founding of our Company, our corporate culture has been built with the aim to provide world-leading manufacturing a persevering spirit to “try before you say you can’t”. A venture spirit passed down through an independent department profit system, and in the pursuit of photonics technology. By adopting this culture we pioneer the best photonic devices in the market, and when incorporated into customer products give heightened performance. Therefore, Hamamatsu Photonics can exist as a company that provides “Key Enabling Technology” at the very foundation of industry, which operate in an inverted pyramid structure. We push forward our aspirations not only for business expansion, but also for the unknown and unexplored realms to contribute to human health and happiness, and to the development of science and technology. At the beginning of this integrated report we introduce in detail why our organization is not an “ordinary company” by illustrating the past, present and future of Hamamatsu Photonics.

## Spirit to develop the world’s best photonic technology without imitation

The roots of Hamamatsu Photonics are found in the spirit of Professor Kenjiro Takayanagi, known as the father of Japanese television. In an era before the concept of television broadcasting when even radio broadcasting had not yet begun, Professor Takayanagi advanced research into television technology with the belief if sound could be broadcast why not images. The spirit of Professor Takayanagi was to pursue unprecedented things and to create unique things without the imitation of other. Our founder, Heihachiro Horiuchi, studied under Professor Takayanagi and was fascinated by light. At a time before industries

utilized photonic technology, Heihachiro Horiuchi realized the future potential of light and started a business using photoelectric conversion technology, inherited from Prof. Takayanagi. One reason Hamamatsu Photonics was able to prosper was due to the foresight of our founder. Everyone at Hamamatsu Photonics has continued to pursue the possibilities of light while always holding dear to the spirit of Professor Takayanagi. One of these people is our former president, Teruo Hiruma. Teruo Hiruma, the Company’s former President, often said “Try before you say you can’t.” He always embodied a spirit to do something new in order to become the best in the world, with the belief our products must not only be the best in Japan but around the globe. The spirit to overcome difficult problems is another part of the foundation of Hamamatsu Photonics. The necessity to generate profits to succeed in corporate management led to an independent profit system in each department. Although our company resembles a single organization, we are in fact a conglomerate of small companies. Each employee has an entrepreneurial mindset which, in a way, gives them the freedom to act while fully generating profit. We have incorporated a system to ensure this venture spirit is never forgotten.

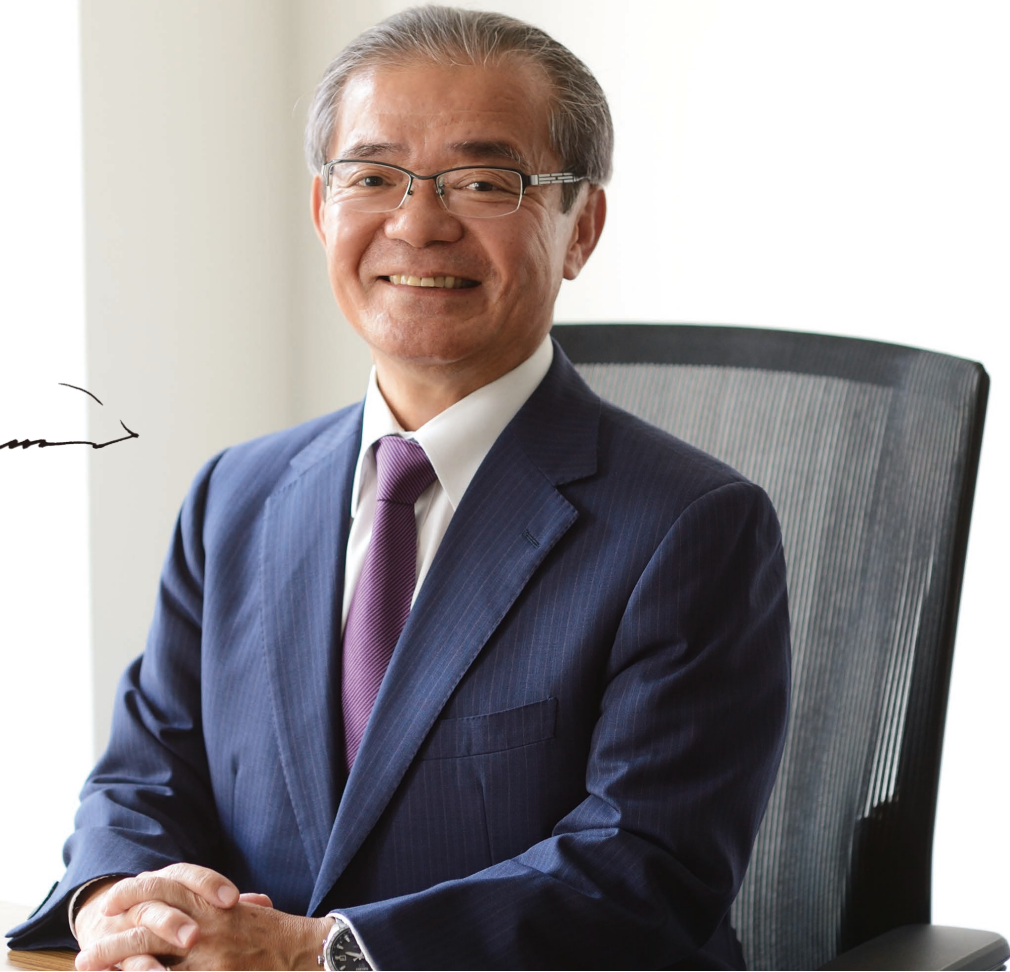
## Contributing to the Global Society through Business

We believe our photonic devices directly contribute to society. For example, our products used in Positron Emission Tomography (PET) scanners for cancer screening play a role in human health. Whilst our products used as ultra-low light detectors for the Kamiokande and the Super-Kamiokande experiments have contributed to two Nobel Prizes. I feel great pride in creating products that directly aid human health and happiness, and to the development of science and technology.



Representative Director and President

Akira Hiruma



At the same time, I understand our photonic devices alone cannot foster human health and happiness. Nothing is possible with only photonic devices. Our products start to have significance once incorporated into the products of our customers. In other words, co-creation with customers is what helps foster human health and happiness. Therefore, communication with customers is also extremely valuable to us. Customers immediately contact us when they have issues related to light. I feel our strength is the extremely close dialogue that we have with our customers.

## Inverted Pyramid Structure Supporting Contributions of Value to Society

Unlike the general industry pyramid structure, industries that utilize photonics employ an inverted pyramid structure. Hamamatsu Photonics creates photonic devices at the bottom of the inverted triangle, while customers use our photonic devices to create modules above us. The next level comprises customers who create system products, while customers who supply services are at the top. Hamamatsu Photonics may be at the bottom of this pyramid structure, but we are not simply a company that supplies components. This is because the performance of the photonic devices we create enhances the back-end performance of our customer’s products. We create vital products known as “Key Enabling Technology,” which are essential core technologies for industries that utilize photonics. (See page 16.)

## Sowing the Most Important Seeds for the Future

Hamamatsu Photonics hopes to develop in our people a venture spirit to pursue the unknown and unexplored realms, as a way to contribute to human health and happiness as well as to the development of science and technology, by having them do

something new such as launch a startup company. By nurturing people who have even greater social insight, I hope they will more actively step out into the world while they are young. The important thing is to create a system where people focus on learning and not on failing. When creating something new every success is backed by the learning from the ideas that did not work as expected. These trials are learning if the eighth try uses knowledge from the first seven tries. Failure only comes from not trying. To create a system where people can take on challenges, we have created completely new programs that include Corporate Venture Capital (CVC, an organization that has the function of investing on its own with its own funds) and a Global Strategic Challenge Center (GSCC, an organization that promotes the ability to become a truly global company through strategic initiatives). We also inspire development by using long-term visions to set lofty goals, such as ridding the world of deaths caused by cancer and developing a high-powered laser for power generation through laser nuclear fusion. In the pursuit of these lofty goals, I expect us to discover unexpected technologies, giving way to new industries. I want our employees to learn this kind of serendipity (the knowledge/skill to make discoveries, different from those being sought after).

## Hamamatsu Photonics Spirit for the Future

The motto that I advocated when I was first appointed President was that “status quo is not an option”. Our competitors will pass us by if we stop pushing boundaries. That is why we must always keep driving forward. Hamamatsu Photonics will continue to pursue the unknown and unexplored realms now and into the future towards the monumental goal of contributing to human health and happiness, as well as to the development of science and technology.

On the 18 August 2017, Hamamatsu Photonics K.K. became a registered participant of the United Nations Global Compact.



Hamamatsu Photonics will continue to grow, making every member of our organization more able to contribute to the betterment of society by creating new industries with photonics technology. We, as a global company, uphold the Ten Principles of the United Nations Global Compact and contribute to the sustainable grown of society.



# Products and Applications

Introduction to the main products and applications of each business segment.

## ■ Photomultiplier Tubes, Imaging Devices and Light Sources

(Electron Tube Segment)

We develop and manufacture optical sensors such as high-speed, high-sensitivity photomultiplier tubes, as well as various light sources.



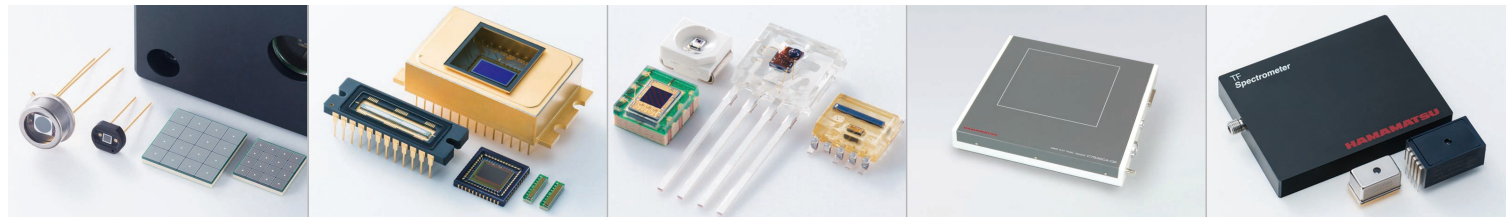
Main Products

- Photomultiplier tubes (PMTs)
- UV-LED light sources
- Ion detectors
- (electron multipliers/microchannel plates)
- Xenon and mercury-xenon lamps
- Xenon flash lamps
- Deuterium lamps
- Microfocus X-ray sources
- X-ray scintillator plates
- Stealth Dicing™ engine

## ■ Opto-semiconductors

(Opto-semiconductor Segment)

We develop and manufacture photodiodes, photo ICs, image sensors, and other opto-semiconductors.




Main Products

- Si photodiodes
- InGaAs photodiodes
- Si APDs
- MPPCs® (SiPMs)
- Image sensors
- Photo ICs
- Infrared detectors
- LEDs
- Mini-spectrometers
- X-ray flat panel sensors
- Opto-semiconductor modules

## ■ Image Processing and Measurement Systems

(Imaging and Measurement Instruments Segment)

We develop and manufacture specialized systems for research and industrial use in the life science, medical, and semiconductor fields.



Main Products

- Measurement camera
- X-ray line scan cameras
- Digital slide scanner
- Universal streak camera
- PMA-12 Photonic multichannel analyzer
- Quantaurus-QY® Absolute PL quantum yield spectrometer
- Semiconductor failure analysis system
- Drug screening system
- Brain and tissue oxygen monitors
- Thickness measurement system

## ■ Lasers

We develop and manufacture high-power semiconductor lasers, solid-state and other lasers.



Main Products

- Single chip laser diodes
- High-power laser diode bar modules
- Quantum cascade lasers (QCLs)
- Semiconductor laser applied products
- Solid state lasers

## ▼ Applications

### Medical-Bio Instruments

We provide photonics technologies and products for various fields. In the medical-bio areas our products are contributing to the efficient discovery of new drugs and establishment of new treatment methods, as well as less invasive patient diagnosis and testing, to foster a future where people can live longer, healthier lives.

### Industrial Instruments

Many of our light sources and detectors, used for inspection and other manufacturing processes, support products which are used in a broad range of fields to realize future production through the standardization of IoT and AI.

### Analytical Instruments

We provide high-performance devices that respond to greater miniaturization, higher performance and other market needs for various analytical instruments used for material, water quality, environmental and other analyses.

### Academic Research

We continually discover new findings that shatter conventional laws and theories, contributing to physics, chemistry, biology and other fields. We are fulfilling a vital role in the advancement of science research, opening avenues to a new future for mankind.

### Measuring Instruments

We supply devices used for 1D and 2D measurements from radiation detection and geological surveys, such as oil, to industrial photoelectric switches.

### Transport Instruments

We supply devices and modules that contribute to the ongoing advancement of automobiles, while integrating IT, electronics and photonics technology.



# The Origin of Management

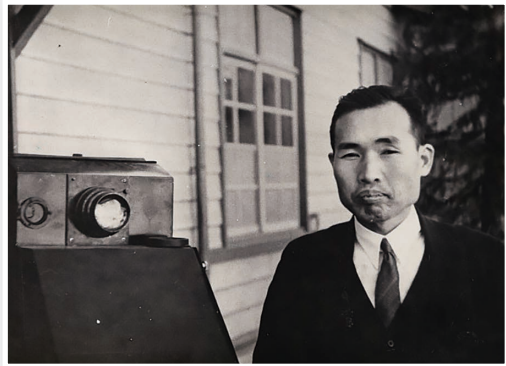
The spirit of pursuing the unknown and unexplored - inherited from our predecessors

## Pursuing the Unknown and Unexplored



Prof. Kenjiro Takayanagi has come to be respectfully known as the “father of Japanese television.” There was always one woman who was a muse to Prof. Takayanagi in his pursuit of the unknown. This woman was “Fortuna” - the goddess of fortune in Roman mythology. As told in these myths, Fortuna only had forelocks with no hair at the back of her head. One would have to be one-step ahead of her, wait for her to catch-up, and then turn around and seize her by her forelocks. When trying to develop technology to benefit society in the next ten or twenty years, we have to strive to go farther ahead than people think is necessary. A pioneering approach led to the success of the world’s first electronic television.

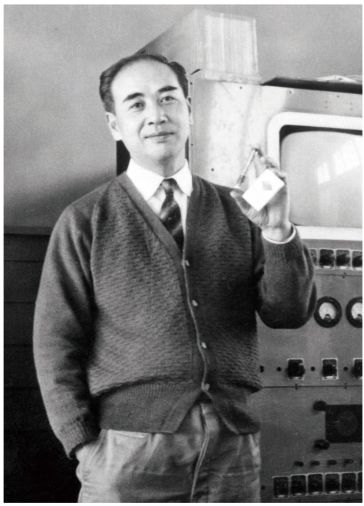
## Seize the Forelocks of the Goddess



Prof. Takayanagi and an Iconoscope Television Camera (1935)

In 1926, Prof. Takayanagi succeeded in receiving images on the world’s first electronic cathode-ray tube. “イ” is derived from the “Iroha” order as the first character of the traditional syllabary. (The picture is of the reproduction device.)

## Light to Electricity, Electricity to Light



Heihachiro Horiuchi and the 1/2-Inch Diameter Vidicon (1963)

## Photonics Technology Will Surely Help Society

Prof. Takayanagi passed on his spirit to create things that did not yet exist in the world to his student, and our founding president Heihachiro Horiuchi and former president Teruo Hiruma. Our entire company fully embodies this spirit. From almost the start of the company’s inception, Teruo Hiruma, who was mainly in charge of sales, encouraged everyone at Hamamatsu Photonics to make the world’s best products. He established a system to engage with the research industry and travelled the world in an effort to develop markets. Teruo Hiruma inherited the ideals of Prof. Takayanagi and Heihachiro Horiuchi, and through his actions, our organization has grown into a world-class company.

The origin of our company to engage in photoelectric conversion technology and the applied products to grow with the advancement of photonic technologies lies in the unyielding spirit to confront the unknown and unexplored realms.

Lecture by Teruo Hiruma (1960)



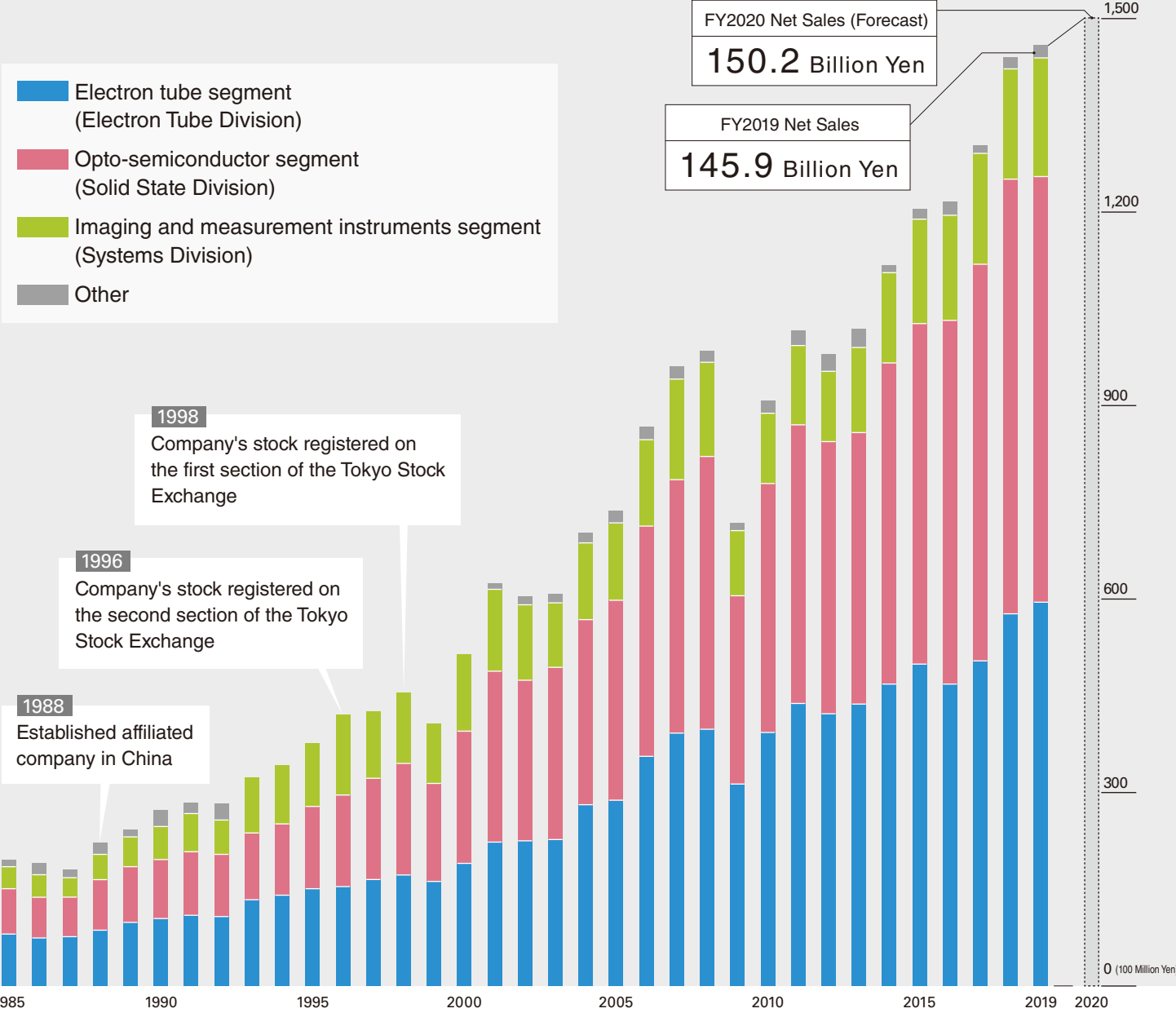
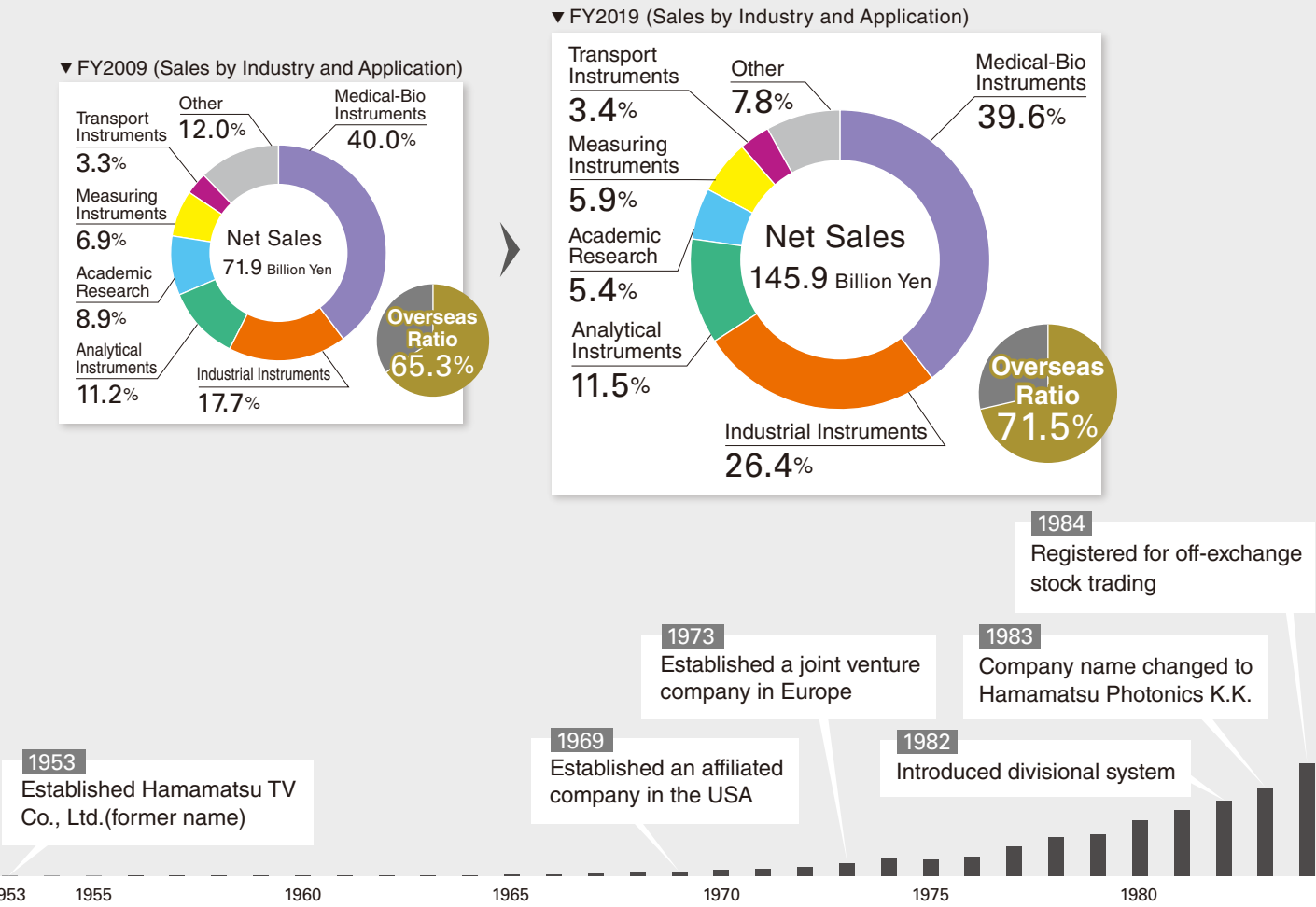
## Make the World's Best Products

At the 25th anniversary ceremony for Hamamatsu TV Co., Ltd. (renamed to Hamamatsu Photonics K.K.), Heihachiro Horiuchi passed the baton of president to Teruo Hiruma. On the left, Prof. Takayanagi attends the ceremony as a guest. (1978)



## What Can We Do with Light?

# Our History



## The history of our growth



1st Term: 1953 to 1972	2nd Term: 1973 to 1981	3rd Term: 1982 to 1989	4th Term: 1990 to 2008	5th Term: 2009 and Beyond
<p><b>From Founding to Product Development</b></p> <p>Inheriting the spirit of Prof. Kenjiro Takayanagi, founding President Heihachiro Horiuchi established Hamamatsu TV Co., Ltd. with the second President Teruo Hiruma. The office building was a storehouse that had survived the flames of air raids. Even while confronting the difficulties of having few knowledgeable and skilled employees, acquiring expertise through literature and other materials this new company took on the work with an unwavering spirit to “try before you say you can’t” toward a goal of making the world’s best products. The unique corporate climate of an “all researchers system” was created, and through the fun in each and every day even during the struggles at the time of our founding.</p>	<p><b>Expand New Applications from Analysis</b></p> <p>The construction of a new factory put in place a production system. However, the impact of the oil shock, and the appreciation of the yen at that time, forced us to face the only financial deficit since the founding of our company. Analysis was the mainstay product application for the company at that time. However, we talked with customers about their challenges and developed 1/2-inch diameter head-on PMT. An opto-semiconductor for X-ray CT scanners then followed. This swept the optical sensor market for X-ray CT scanners and recovered our business performance. Thereafter, we developed other new products and generated new demand to expand applications from analytical and medical fields to industrial, academic, measurement and a wide range of other fields.</p>	<p><b>Establish Current Management Base through a Divisional System</b></p> <p>To acquire advanced technology and expertise, and continue to drive superior planning and development capabilities, heightening the reputation of the company is indispensable in securing and cultivating excellent human resources. Therefore, we changed the name of the company to Hamamatsu Photonics K.K. and grew into a public company by officially registering on the over-the-counter of the stock market. As the corporate scale expanded and products diversified, we introduced a divisional system, which has become our current management base, to engage in business activities that can flexibly maneuver more efficiently, to adapt to the changing times.</p>	<p><b>A New Challenge to the Human Unknown and Unexplored Realms</b></p> <p>A strong mentality to make the world’s best products is strengthened by our employees thanks to our work to establish superior technology and develop new products unified as a company. Furthermore, to achieve even more high-minded company goals, we had to take on challenges in the “human unknown and unexplored realms” that bring about new research findings. As some specific fruits of these pursuits, we established the Central Research Laboratory, the Hamamatsu Medical Imaging Center for validating the early detection of cancer and dementia, and the Graduate School for the Creation of New Photonics Industries for the education of human resources who aim to create new industries that use photonics technologies.</p>	<p><b>Change of President, Establishment of a Cross-divisional Department</b></p> <p>Akira Hiruma was appointed as the third president of Hamamatsu Photonics, succeeding Teruo Hiruma who had led the company since its founding. The divisional system is a framework that is able to ensure stable earnings, but a cross-sectional department was established to drive growth. The cross-sectional department acts as a new organization to maintain sustainable growth from the business headquarters that links mid-to-long-term research and development, as well as sales activities throughout the entire company. In addition, to the compound semiconductor fabrication center that integrates the compound semiconductor pre-processes expected to diversify future applications, and the GSCC promotional organization to put in place strategies to take on challenges as a global company.</p>
Research Industry ▶ P11	Greek Days ▶ P11	Cash Voucher System ▶ P12	Contributions to the Nobel Prize ▶ P12	



# 01 / Research Industry



▲ Our first side-on photomultiplier tube type R105 in 1959

“Once the photomultiplier tube is made, I'll call you sir Hamamatsu TV”

These words were said by one of our partners, just after Hamamatsu TV Co., Ltd was founded. At the time, photomultiplier tubes were a product major enterprises were struggling to realize. The world thought Hamamatsu TV, which was still a small local workshop, had absolutely no chance of developing a photomultiplier tube. However, at the time, these words energized our engineers. They held stubbornly to their position and at the workbench repeatedly enhanced prototypes, before asking for, and intently listening to feedback from customers, only to then re-start the trial-and-error process all over again. Based on the belief that the world would surely accept Hamamatsu TV, tremendous amounts of tests were carried out every day. Now, 60 years later, the photomultiplier tubes made by Hamamatsu Photonics continue to be a mainstay product that packs performance far and above other photomultiplier tubes on the market. Great care and passion is part of our daily work. We discover unknown phenomena and realize things thought impossible. We use this as a stepping-stone in the further pursuit of the advancement of new photonics technologies. This in and of itself is the research Industry. In the ongoing quest to explore the unknown, curiosity and craftsmanship remain constant to serve as the driving forces propelling us to new heights.

# Episodes

Historical Episodes

# 02 / Greek Days

It's Greek!

We host exercises and lectures unrelated to everyday business for our employees in an aim to nurture global human resources who have sound minds and bodies. These are Greek Days. Among these events, the particular favorite of our employees is the open use of all workplace facilities and testing equipment. This gives employees the opportunity to run experiments with equipment that cannot usually be used, offering them a chance to research things they have always wanted to, and stimulates a tremendous love for learning. Conducting activities that stop operations as a part of business was a difficult management decision at the time, but Greek Days have largely contributed to shaping the corporate climate at our company that values self-enlightenment. “Health and education, valuing employees, and giving research opportunities to all”. One of the reasons we have been able to grow the company consistently in Hamamatsu City is that our corporate culture has been cultivated through Greek Days.

- ▶ Greek Days activities (Associate Prof. Yaichiro Hirasawa guided physical exercise at the Faculty of Engineering of Shizuoka University)



▲ Cash Vouchers used today

The motivation of each employee is important. As part of our organization, we have been searching for ways to stimulate motivation for all employees. After the first oil crisis, the Japanese economy faced appreciation of the yen and a period of low growth. We had to find ways to cut costs and improve productivity, but success required every employee to be motivated to take action. Therefore, we started a cash voucher system as internal currency with the aim to encourage everyone to act with a managerial mentality. All of our internal economic activities used these cash vouchers and each department was financially independent. For example, when confronted with insufficient funds, departments would borrow and pay back cash vouchers with interest. By doing so, we were able to enhance a sense of profitability regardless of group size or operational responsibilities. Today, the cash voucher system supports our management base by evolving according to changing times and business conditions while raising managerial awareness through the ongoing participation of our employees.

# 03 / Cash Voucher System

You can lead a horse to water, but you can't make him drink.

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“Try before you say you can't.”

Our conviction to respond to the needs of our customers has supported the growth of the company. In 1979, Prof. Masatoshi Koshiba from the University of Tokyo's School of Science asked us to develop a 20-inch-diameter PMT. At the time, the world was working to develop 8-inch-diameter photomultiplier tubes while we had just begun development of 5-inch and 8-inch-diameter photomultiplier tubes. This was not a simple request, but swayed by the passion of Professor Masatoshi Koshiba, we started development. Many challenges confronted us, but we concentrated on the manufacturing technology we had amassed into this large tube development. Just five months after the start of the development, the 20-inch-diameter photomultiplier tube was completed and in 1982 we successfully delivered 1,050 20-inch-diameter photomultiplier tubes for Kamiokande. On the 23 February 1987, at 4:35 in the afternoon, a neutrino from supernova 1987A that appeared in the Large Magellanic Clouds 160,000 light years from Earth, was captured. This was the first time in the world a supernova neutrino had been observed. It heralded the dawn of neutrino astronomy - the search for astronomical objects through elementary particles. Almost 1,000 of the world's largest photomultiplier tubes embedded in a water tank continued to operate normally in water for four years. By providing products with the required performance, Hamamatsu Photonics was able to contribute to this outstanding achievement, which started a new page in astronomy. In addition, Prof. Masatoshi Koshiba earned deeper regard from everyone involved, for his amazing achievement of observing the neutrino, merely one month before his retirement.

- 2002 Prof. Masatoshi Koshiba awarded the Nobel Prize in Physics Kamiokande Colossal achievement of neutrino observation [Photomultiplier tube]
- 2013 Prof. Higgs and Prof. Englert awarded the Nobel Prize in Physics CERN Discover Higgs boson [Opto-semiconductor devices/photomultiplier tubes]
- 2015 Prof. Takaaki Kajita awarded the Nobel Prize in Physics Super-Kamiokande Discovery that neutrinos have mass [Photomultiplier tube]



▲ Prof. Masatoshi Koshiba (Left), Teruo Hiruma (Center) and Prof. Sydney Brenner (Right), awarded the Prize in Physiology or Medicine the same year, at the Nobel Prize Ceremony.

Photo courtesy of Chunichi Shimbun



# Hamamatsu Photonics's Value Creation Model with Light

Pursuing the Unknown and Unexplored Realms

## Human Health and Happiness and the Development of Science and Technology

- Early detection of diseases
- Extended healthy life expectancy
- Industry development
- Environmental conservation
- Promotion of academic research

## Enhanced Corporate Value

Continuous and Stable High Earnings System

- Unique governance system
- Development of new markets
- Higher motivation
- Accumulation of technology

## Electron Tube Segment

Photomultiplier Tubes, Imaging Devices and Light Sources

## Opto-semiconductor Segment

Opto-semiconductor Devices

## Imaging and Measurement Instruments Segment

Image Processing and Measurement Systems

## Human Resources

- Yaramaika (Let's Give It a Try) Spirit  
→ "Try before you say you can't."  
High motivation and lofty goals
- A Mind of "Wa"  
→ Better human relationships and knowledge integration.
- All Researchers System  
→ Overcoming challenges in daily operations
- Interaction between Employees  
→ Club activities, summer festivals, athletic meets

## Technology

- Sales/Manufacturing/Development Partnership System  
→ Full support of customer needs
- In-house Production Facilities  
→ High-mix low-volume production/customer service
- Integrated Production Sites  
→ Cross Division Development

## Expertise

- Cooperation between departments  
→ Presentations on prototypes as well as research and department management results
- Industry-academic-government partnerships  
→ Establishing Hamamatsu as a Preeminent Photonics City  
Photonics Declaration 2013 in Hamamatsu
- Pursuing performance to its farthest boundaries  
→ Accumulation of tacit knowledge

## Organization

- Departmental sales management  
→ Formulation of sales plans from the bottom-up.
- Central Research Laboratory  
→ Investing in the human unknown and unexplored realms

Four Capitals

World-leading Manufacturing

Aim for Number One and One of a Kind

Everyone is a Manager

Department Independent Profit System

- ✓ High Degree of Freedom
- ✓ High Cost Awareness
- ✓ Rapid Decision Making
- ✓ Hands-on Approach

High-performance, High-quality Products that Meet Global Needs

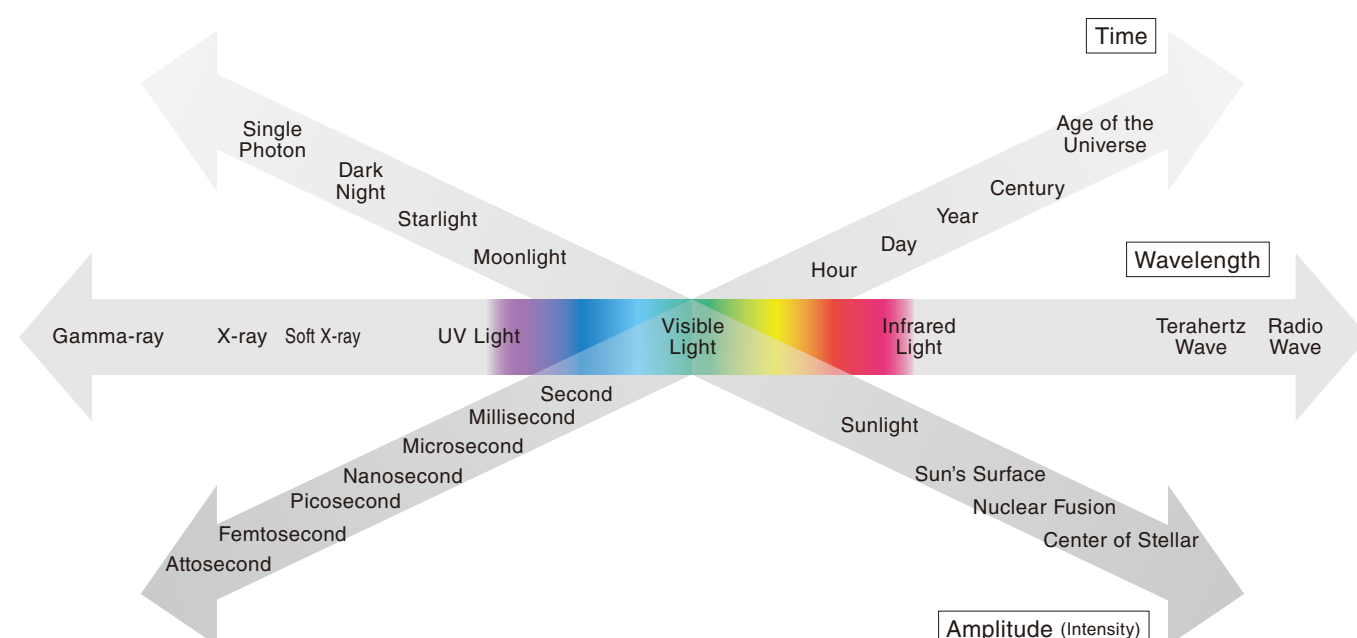


# What is “Light”?

Always striving to reveal the infinite and hidden potential of light.

“Light” is always present around us and is still filled with much mystery.

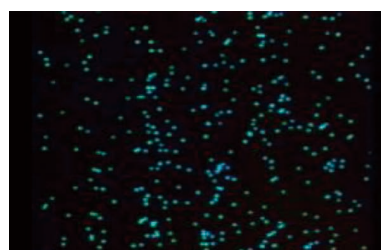
The core of these mysteries is found in the strange nature of light that has the properties of a wave and a particle, no mass, and travels faster than anything else in the universe.



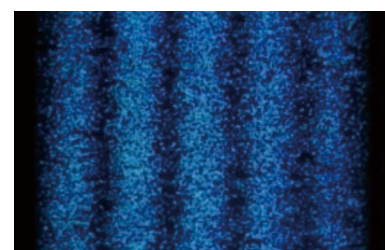
The human eye can detect “visible light” at a wavelength between 400 to 700 nanometers. Visible light corresponds to the multiple colors of the rainbow. UV light, X-rays, and gamma-rays exist on shorter wavelengths than those beyond the violet. On the other hand, infrared light, terahertz waves, and radio waves exist on the longer wavelengths than those beyond the red. In addition to wavelengths, light also possesses many other attributes such as amplitude (intensity), time, polarization and phase, which influence various aspects of our world. The reason to extend the use of photonics technology in the field of advanced science, such as unknown elementary particles and gravitational wave detection can be found in these characteristics. Light is the source of potential to expand the knowledge of mankind. We contribute to human health and happiness, as well as the development of science and technology, through the supply of optical sensors, light sources and the systems using them.

## Wave-Particle Duality of Photons

This is Young's Interference Experiment or Double-slit Interference Experiment. This experiment shows interference fringes appear even if the light is drastically weakened to the level of having only one particle. This demonstrated that in the double-slit interference experiment, one photon particle simultaneously passed through the two slits and interfered by itself. Photon has the wave-particle duality.



▲ When light weakened to an extremely low brightness limit and projected on a screen is detected, it behaves like a particle.



▲ However when the recorded particle count increases, an interference fringe appears.



▲ Watch a video of the experiment.

# Key Enabling Technology

Nothing is possible without it.

No destination can be reached without it.

Future needs cannot be realized without it.

We are proud that our photonics technology is a Key Enabling Technology.

The structure of general industry is a pyramid shape with the end-product manufacturers at the top.

However, the structure of the applied photonics industry is an inverted pyramid shape.

Hamamatsu Photonics, as a supplier of devices such as optical sensors and devices, is positioned at the bottom.

The size and fields of these industries grows as we move upward.

However, Hamamatsu Photonics does not simply supply products from the bottom of this pyramid, but rather supplies the Key Enabling Technology that heightens end-product performance found at the core of industries that utilize photonics.

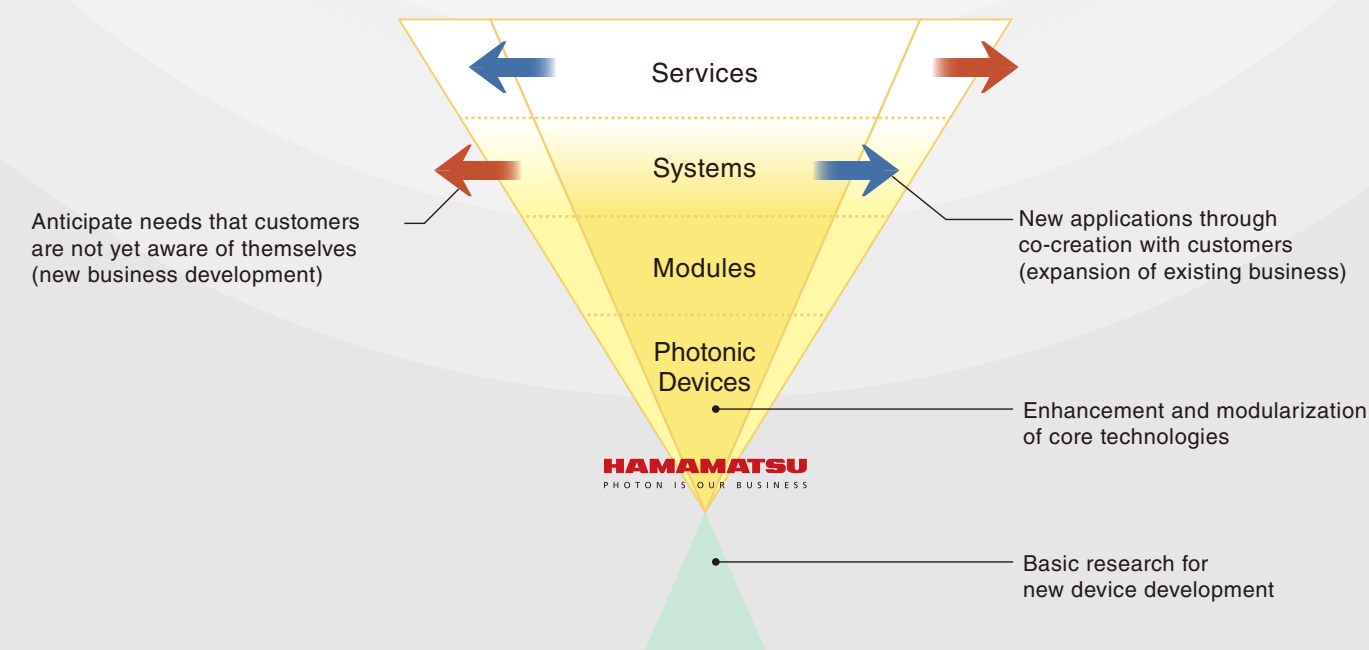
As we expand our business reach upwards from photonic devices to modules, co-creation with customers discovers new applications,

broadens the angle of the inverted pyramid structure for industries that utilize photonics, and diversifies the utilization of photonics technology.

Moreover, to anticipate needs that customers are not yet aware of themselves, we must collaborate with ventures that aim for new businesses that use photonics technology, which in turn means that developing internal ventures is important.

In the future, we will nurture and embody the same venture spirit we have held since our founding, while strengthening our core photonic devices to strategically broaden the industries which utilize photonics, and foster sustainable growth.

## [ Sustainable Growth Strategy ]



Activities for the Environment

# Earth Health Assessment via Photonics Technology

## Significance of Our Environmental Initiatives

Environmental pollution, depletion of resources, climate change, and large-scale disasters have become important environmental issues faced by all. Our goal is to realize human health and happiness. That is why Hamamatsu Photonics cannot ignore the need to resolve environmental problems through its business. We proactively invest in research and development to drive unique photonics technologies, and continually develop products and technologies that are able to help find solutions to environmental problems. Hamamatsu Photonics leverages its strengths with the goal of realizing an Earth Health Assessment through photonics technology.

### What is an Earth Health Assessment?

A response founded in accurate measurement, analysis and diagnosis of root causes is essential to solve current and future environmental problems. The Earth Health Assessment is a concept that demonstrates our passion to realize environmental conservation and sustainable growth through the use of our products and technologies in the environmental measurement field, which demands greater reliability with even more precision.

## Specific Activities

Co-creation with customers will promote the development of products that contribute to the environment through adoption of the Earth Health Assessment. It will also pioneer environmentally-friendly product development, such as greater resource savings (smaller/lighter), power savings, and a longer life compared to conventional products. In addition, lowering the impact to the environment, by producing products without using hazardous substances restricted under the RoHS directive.

### ■ Product Examples

#### Ion Detectors (CERARION™)



▲ Lead-free channel electron multiplier

#### Type II Superlattice Infrared Detector




▲ No RoHS restricted substances


#### Mid-Infrared Laser Diode (QCL)



▼ For additional information, please refer to the links below.



Mass Spectrometry



Gas Analysis (Environmental Monitoring, etc.)

### Fruits of Our Efforts

#### ▶ Example

## Greenhouse gases Observing SATellite “IBUKI” (GOSAT)

The satellite “IBUKI” was jointly developed by the Ministry of the Environment (MOE), the National Institute for Environmental Studies (NIES) and the Japan Aerospace Exploration Agency (JAXA) as the world's first satellite dedicated to observing greenhouse gases. The IBUKI measures CO<sub>2</sub>, CH<sub>4</sub> and other greenhouse gases from space for the main purpose of increasing the measurement accuracy of greenhouse gas absorption and emissions. Our infrared detectors are used as the observational sensors in this satellite. Since its launch in 2009, the IBUKI has measured a large amount of data used to scientifically understand and respond to global warming and climate change.

Example of Observation Data  
<https://global.jaxa.jp/press/2019/03/20190319a.html> ▶



©JAXA

### ■ Environmental Management Initiatives

In accordance with the fundamental environmental policy to operate and continually enhance the environmental management system, Hamamatsu Photonics has established a Headquarters Environmental Committee, chaired by the General Environmental Management Representative (Managing Director). We have identified risks and opportunities brought about by climate change as important considerations and implemented third-party testing of greenhouse-gas emissions in accordance with guidance of international standards, (ISO 14064-3), and introduced renewable energy.

Certification under ISO 14001  
(Percentage of employees) **95.8%**

Renewable Energy  
Usage Rate **5.7%**

## Future Challenges and Countermeasures

We need to delve even deeper into our investigations and practices in the growing field of green technology to determine how our company can help. We aim to realize solutions to needs and challenges that we have not yet realized ourselves through co-creation with our customers.

▼ For more information, please refer to the link below.



Environment

<https://www.hamamatsu.com/jp/en/our-company/csr/environment/index.html>



Activities for Society

# Efforts for the Vital Human Resources of Hamamatsu Photonics

## Significance of Our Activities for Society

We hope to provide value to society, such as the human health and happiness, through our activities for society. Our employees are the foundation for us to achieve this goal. Therefore, we work to provide a work-friendly environment for all of our employees and strive to maintain and improve their physical and mental health. To fulfill that need, we recognize the importance of building an organization and corporate culture in which employees are encouraged not merely to support the status quo but to actively engage based on free and innovative thinking.

## Specific Activities

### ■ Ensuring Work-life Balance

We believe enriching the home, community and other social infrastructure is important for every employee to actively participate in the company. That is why we consult with the labor union as necessary and have put programs in place, as we strive to ensure a work-life balance.

To eliminate long working hours, the management oversees employees' work hours, and the labor-management council verifies them.

Every Wednesday is designated a no-overtime day.

Managers are provided with appropriate training.

When an employee's overtime seems excessive, managers engage in dialogue with that employee and arrange for interviews with an appropriate professional, such as an industrial physician or public health nurse.

The company invites outside instructors to run seminars on topics including childcare support system, nursing care and mental health.

Various policies are implemented to balance work, children, nursing care, and medical treatments of individuals and their families.



▲ Childcare support system seminar conducted by outside director Kashiko Kodate

● Employees Taking Temporary Childcare Leave (Persons)				● Reinstatement Rate after Temporary Childcare Leave (%)			
	2016	2017	2018		2016	2017	2018
Men	27	25	39	Men	100	100	100
Women	26	34	31	Women	100	100	100
Total	53	59	70	Total	100	100	100

### ■ Health Management Initiatives

In accordance with its Corporate Health Policy, Hamamatsu Photonics promotes health management in cooperation with the health insurance society. The Company implements various measures after proposal, discussion and approval by the Headquarters, Branch Health and Safety Committees and by the Executive Committee.



▲ Physical strength measurement

To maintain and improve the physical strength of employees, the Company holds a body design school, and conducts physical strength measurements. Employees are also encouraged to walk and use sports facilities.

In addition to the regular medical check-ups mandated by law for the purpose of the early detection and treatment of diseases, we also conduct dental check-ups.

We recommend health screening and PET examinations to our employees. Hamamatsu Photonics and the health insurance society pay a contribution to the fees.

As part of our mental health measures, we have formulated a three-year, mental health promotion plan. The mental health education program is tailored to each employee rank.

All employees are encouraged to recognize the signs and different types of stress through our stress check-up program, known in-house as the “Mental Health Check”. This aims to reduce stress in the workplace, together with group analysis and on-site training.

## Fruits of Our Efforts

These activities have heightened employee awareness about paid leave. The average acquisition rate of paid leave in FY2018 was 74.6% (71.3% in FY2017) with a job turnover rate of 0.3% (FY2018). Our net sales per hour increased approximately 7% in FY2018 compared to the previous fiscal year, which demonstrated improved productivity. Employees also showed a higher awareness about their health with an 84.7% participation rate in physical strength measurements conducted during daily working hours. Additionally, the percentage of employees on mental health leave was 0.37% (FY2018), which is dramatically lower than the average (0.8%) for business sites with 1,000 or more employees.

For two consecutive years, 2018 and 2019, the Company earned certification as an Excellent Health and Productivity Management Corporation (Large Enterprise Division) (White 500).

2019  
Health and productivity  
White 500

Average Acquisition Rate of Paid Leave **74.6%**

Job Turnover **0.3%**

Participation Rate in Physical Strength Measurements **84.7%**

Percentage of Employees on Mental Health Leave **0.37%**

(2018年度)

## Future Challenges and Countermeasures

Hamamatsu Photonics primarily recruits science students. This has created a tendency to hire relatively few women because the percentage of women in the sciences is low. Ensuring diversity is important to facilitate multifaceted viewpoints in the development of new technology in the future. For this reason, we are engaging in recruitment activities as per the action plan outlined in the Database on Promotion of Women's Participation and Advancement in the Workplace. Additionally, we always strive to better the working environment and promote health management in an effort to make certain every employee can live a prosperous life.

▼ For more information, please refer to the link below.

CSR/ESG Information

<https://www.hamamatsu.com/jp/en/our-company/csr/index.html>

- Electron Tube Division (Electron Tube Segment)
- Solid State Division (Opto-semiconductor Segment)
- Systems Division (Imaging and Measurement Instruments Segment)
- Central Research Laboratory

# Review and Vision of Each Division

■ Electron Tube Division (Electron Tube Segment)

## Pursuing performance to its farthest boundaries

Pursuing the ultimate in performance, guided by our experience in fabricating devices for academic research, has led to applications in high-precision optical measurement such as medical, environmental and measurement fields. Its applications have even extended to monozukuri, or namely the creation of things that support life.

P.23

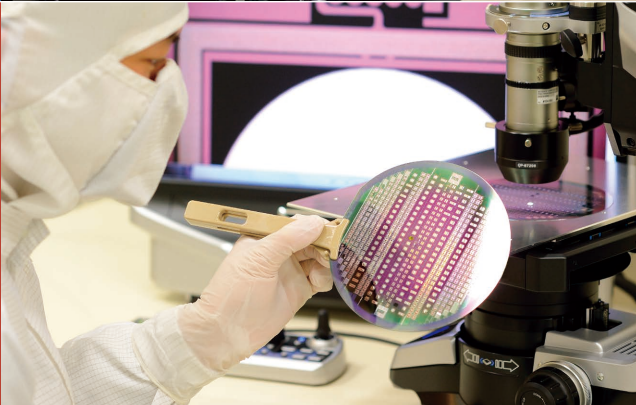


■ Solid State Division (Opto-semiconductor Segment)

## Toward the possibilities of the new photonics technology

Getting a grasp on what lies one-step ahead for our world. Pushing the limits of our unique opto-semiconductor technology to meet advanced user needs.

P.24

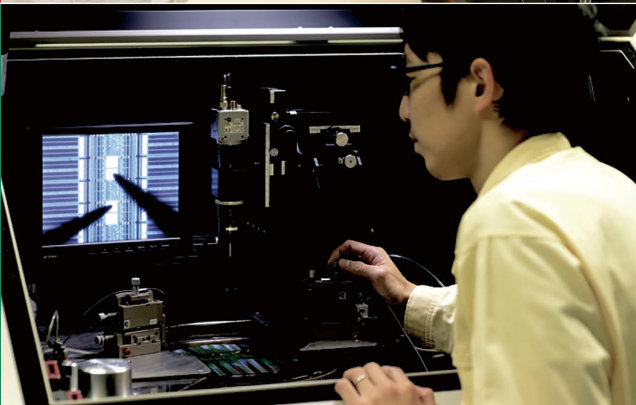


■ Systems Division (Imaging and Measurement Instruments Segment)

## The key to further progress

Creating the breakthrough specialized systems based on the optical sensor technology.

P.25



■ Central Research Laboratory

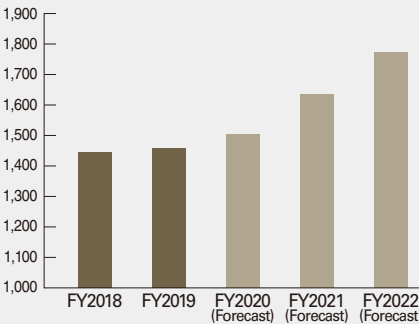
## Life Photonics

A future world with an optimal balance among Earth, people, and all life - we aim to achieve this wonderful dream through the research into "light" which is the source of all substances.

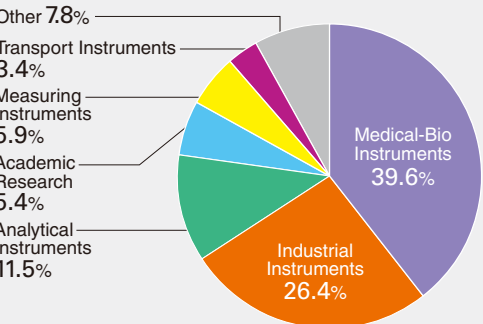
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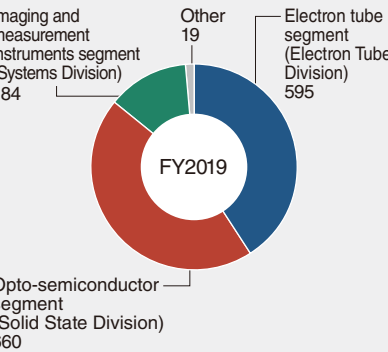
▼ Medium-term sales plan (Unit: 100 Million Yen)



▼ Sales ratio by industry and application FY2019



▼ Consolidated financial results by business segment (Unit: 100 Million Yen)





# Electron Tube Division

(Electron Tube Segment)

Photomultiplier Tubes, Imaging Devices and Light Sources

Electron tube devices are key devices for measuring and capturing phenomena that were impossible to find up to now. We achieve this by applying our long-fostered basic and element technologies. Our new manufacturing technology creates innovative devices that are more compact and optimized for particular usage environments, expanding the application fields of the equipment in which those devices are integrated. Electron tube devices that have actively been used in a wide range of fields including medical diagnosis, spectroscopic analysis, semiconductors, biology, and academic research are now being pushed to their ultimate performance limits to meet customer needs and to expand the market.

## ▼ Message

### Our Strengths

The Electron Tube Division innovates and develops products by having every employee participate in the research industry. We open avenues to new markets through the products realized in this development, and grow together with our customers to always foster sustainable growth. Since our founding, the manufacturing process for our mainstay product of photomultiplier tubes has required a high-level of manual labor. That is why I believe the basis of development is in the production site, where manufacturing actually takes place. The ongoing pursuit of performance to its farthest boundaries in day-to-day operations, not only by those in charge of development but also on the production site, has championed high-performance, high-quality products impossible for competitors to match. In addition to being profitable, this approach offers each small department a lot of freedom in product development, and it lets these teams actively work to develop products for new markets, even if they are small. This also continually brings added value to customer products and, as we expand the market together, meeting the needs of the customers who use the new products that are developed.

### Review of FY2019

Photomultiplier tube sales declined for high energy physics experiments and other academic projects due to factors such as the completion of deliveries to major overseas projects. However, sales increased in the medical sector thanks to their strong reputation for high sensitivity, low-noise, and high-speed operation in laboratory testing equipment for the analysis of blood and living tissue. The sale of photomultiplier tubes also increased due to the recovery in oilfield investments and a strong sales performance for oil-well logging devices with superior resistance for the operation under harsh environment, such as high-temperatures, shocks, and vibrations. In the industrial sectors, imaging devices and light sources were hit by a slowdown in China's economy and restrained capital investment, but sales of microfocus X-ray sources for non-destructive testing devices increased for battery inspections and other evaluations. The Stealth Dicing engine for high-speed, high-quality silicon wafer dicing increased as a result. Furthermore, sales of imaging devices and light sources increased driven by overseas sales for environmental analysis such as deuterium lamps. A product line-up of advanced technology continued to provide stable growth with 59.5 billion Yen in net sales, up 3.1% year-on-year. This year was the one in which the strength of Electron Tube Division could be felt. To elicit growth in the future, we have also begun construction on a new wing to develop new light source and X-ray source products targeting industrial fields as well as to reinforce the development of element technologies for electron tube products. This new wing is scheduled for completion July 2020.



Division Director, Electron Tube Division  
**Kenji Suzuki**

### For Future Growth

In addition to photomultiplier tubes, light sources and other existing products, the Electron Tube Division has been investing for more than 20 years in laser applications, such as lasers for cutting semiconductor wafers. These laser applications are expected to allow for the further expansion into other markets for medical, optical and many other uses beyond applications for semiconductor manufacturing, such as dicing. We will enhance the development of laser-applied products, including at the new wing set for completion in July 2020. We will develop the next generation of the Stealth Dicing engine and expect to see a growth in sales of laser scanning microscopes and OCT applications.

# Solid State Division

(Opto-semiconductor Segment)

Opto-semiconductors

The Solid State Division has explored physical properties that determine opto-semiconductor performance since the early days in this field. They have succeeded to create an extensive portfolio of products. Our opto-semiconductor products incorporate unique semiconductor process, mounting and packaging technology, and MEMS technology. They cover a wide wavelength range from infrared, visible, ultraviolet, through to X-rays and high-energy rays. They are used in a wide range of fields including medical, scientific measurement, communications, consumer electronics, and automotive electronics. We will continue to pursue opto-semiconductor technology, always staying one-step ahead, to meet the increasingly sophisticated needs of the future.

## ▼ Message

### Our Strengths

The Solid State Division does not develop technologies and equipment for a single application, but for horizontal expansion to other applications. This is to maintain a high-mix low-volume production, that meets customer requirements whilst also increasing production efficiency and ensuring sustainable growth. By applying opto-semiconductor design and manufacturing technology, fostered in-house over many years, Hamamatsu Photonics provides the high-performance products needed by customers and offers customized modules according to their requirements. The enhanced performance of opto-semiconductors is always tailored to customer needs, but it does not limit use to any particular industry that uses a large quantity of semiconductors, but rather expands the use to applications in other industries, such as the medical and analysis sectors cultivated by photomultiplier tubes. Due to the easy handling unique to opto-semiconductors, including the ability for compact, low-voltage use, these products are also used in the transport and consumer sectors. This extension to various applications is vital to offer customers added value and to remain market leaders.

### Review of FY2019

Opto-semiconductors showed increased sales centered around X-ray flat panel sensors for dental use, in addition to a strong sales performance in the medical field for products such as our mainstay silicon photodiodes. However, the global restrained capital investment affected and sales of image sensors for semiconductor fabrication and inspection equipment declined. For the reasons above, the Opto-semiconductor Segment showed 66 billion Yen in net sales, down 2.2% year-on-year, due to declining sales of photodiodes and LED in the Factory Automation (FA) sector for applications such as controls for industrial-use robots and other equipment worldwide. Business performance has fallen, but the factors are mainly attributed to the external environment and not a result of a change in product superiority. Therefore, the Solid State Division continued to make capital investments and completed a new wing in July 2019 that consolidates the development departments for module products. We are making ongoing investments in module products, such as the ASIC electronic circuit technology and MEMS microminiaturized technology. The current consolidation of our module departments configures a system for the modularization required by many markets, and it is a structure that we can expect to foster further growth.



Division Director, Solid State Division  
**Koei Yamamoto**

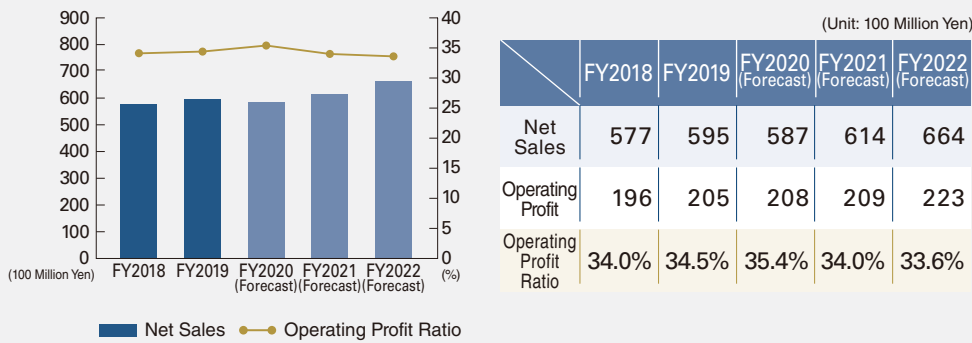
### For Future Growth

The compound semiconductor fabrication center that integrates the compound semiconductor pre-processes was completed in 2017. In the future, we will combine compound semiconductors with silicon and reinforce product development in the near-infrared range by strengthening cooperation with the compound semiconductor fabrication center. In the near-infrared range, applications for many sectors, including analytical instruments, are expected in addition to LiDAR used for autonomous driving of automobiles.

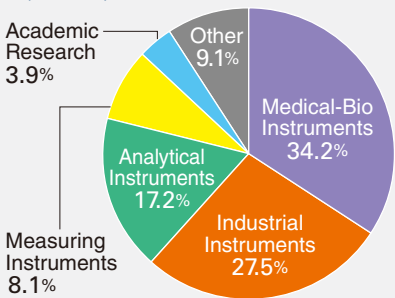
LiDAR...Analyzes the distance to an object by emitting laser light to a target and detecting its scattered or reflected light with a photosensor.

Data

### ▼ Consolidated financial results by business segment

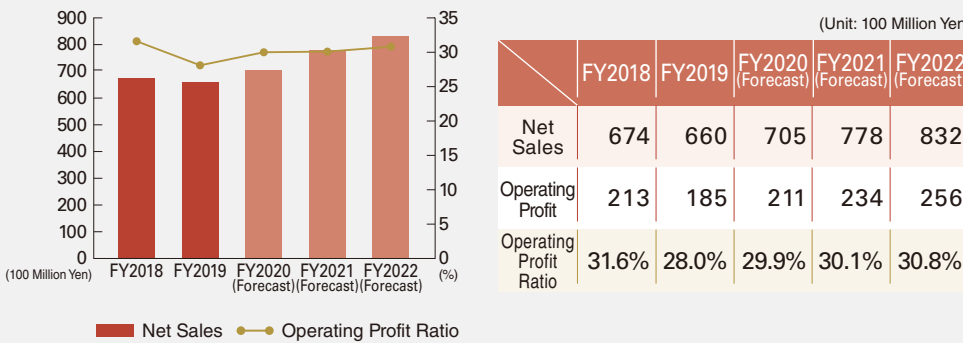


### ▼ Sales ratio by industry and application (FY2019)

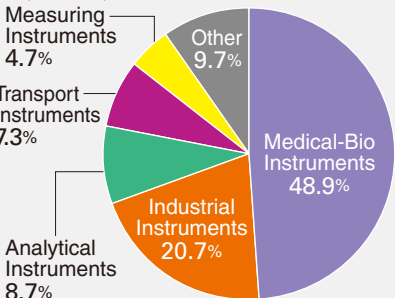


Data

### ▼ Consolidated financial results by business segment



### ▼ Sales ratio by industry and application (FY2019)



# Systems Division

(Imaging and Measurement Instruments Segment)

Image Processing and Measurement Systems

Our Systems Division is developing and manufacturing systems that integrate light detection technology, imaging technology, and image processing technology by using optical sensors. As a leading sensor manufacturer, we use our expertise and technology to design and develop specialize systems that combine core products, such as cameras, with peripheral technology and equipment.

## ▼ Message

### Our Strengths

The Systems Division, through a development structure that can clearly satisfy market needs, will ensure sustainable growth. As our products are manufactured for end-users, I also think designs based on marketing are important. The Systems Division is gathering feedback directly from users across many markets to fully understand their needs. These include the industrial sector, medical and academic fields. To meet those needs, sensors and software are developed in-house as key devices for our products. By designing optimal products, we are able to produce competitive products. To create optimal designs that are more efficient than conventional products, we are expanding common technology in the Systems Division by consolidating the design departments, previously divided by application.

### Review of FY2019

The sale of failure analysis systems for semiconductor devices was negatively affected by the restrained capital investment in the semiconductor market, particularly sales in Asia. However, sale of digital cameras differentiated from competitor products for low noise increased due to higher demand in the life sciences and biology sectors as well as industrial field. Sales of X-ray line scan cameras also increased for electronic substrate inspections and other such applications. In addition, we are seeing a steady growth for food inspection applications. As a result, the Imaging and Measurement Instruments Segment had 18.4 billion Yen in net sales, up 7.2% year-on-year.

### For Future Growth

As with the other divisions, one of the strengths of the Systems Division is providing product applications over wide-ranging fields even while manufacturing end products, but this causes impeded growth due to our inability to focus on individual products with sluggish growth for a particular term. However, we understand market needs in this business, and have steadily increased our market share and continue to grow. By fully understanding and digging deeper into the information we have already gathered about market needs in existing markets, we will be able to generate new needs and propose products to satisfy those needs. To grow our business, stronger marketing and design is indispensable and human resource development is vital. For this reason, we have transitioned our educational programs from OJT training to programs that include external training. We are also actively deploying human resources overseas to elevate our understanding of local needs. In 2016, we created a new group on a trial basis, to listen to the local customer needs in America. We have four employees deployed overseas as part of this new group. In the future, we will concentrate on human resource development that supports growth.



Division Director, Systems Division  
Tadashi Maruno

# Central Research Laboratory

Basic and Applied Research

What will our future be like 20 or 30 years from now? How about a future where all people can enjoy comfortable and active lives with peace of mind, and where optimal balance is maintained among the Earth, its people and all living things? To make this dream a reality, we will have to overcome many obstacles and challenges. Our Central Research Laboratory is conducting R&D work that conforms to “sustainability” values. We call this work “Life Photonics” which is based on the theme of “life” encompassing a broad range of areas such as life, living things, human life, vitality sources, and ways of living. We will continue researching a diverse spectrum of photonics and optical technologies taking “Life Photonics” as our motivating theme.

## ▼ Message

### Genesis and Role of the Central Research Laboratory

By 1990, Hamamatsu Photonics had gradually grown, and its divisions were able to produce the world’s best products. In the area of research and development, we began participating in joint research as our network expanded to include the world’s foremost researchers. To pursue the unknown and unexplored realms of light in this environment, everyone needs to recognize the subsequent direction of research and development. The Central Research Laboratory was established in Hamakita Ward, Hamamatsu City, to act as a compass which guides us into the future. We have also further expanded our laboratories to include the Tsukuba Research Center and Industrial Development Center (Nishi Ward, Hamamatsu City). The Central Research Laboratory is currently advancing basic research and the applied research of photonics technology under the keywords “Life Photonics.” “Life” here does not refer to concepts such as medical and life sciences but it takes on the broad meaning of life and living. By making this “life” possible through photonics technology, we will help build a sustainable society. The Central Research Laboratory has two primary roles. Our first responsibility is to contribute to Hamamatsu Photonics business. We will help foster growth by providing the expertise and technologies necessary for product development in each division, while collaborating with them to commercialize products using our accumulated knowledge. Our second responsibility is to advance research into fundamental measurement and fundamental physics in the pursuit of the unknown and unexplored realms of light. By standing shoulder-to-shoulder with universities and research institutes worldwide and conducting leading-edge research, Hamamatsu Photonics obtains new findings develops science and technology, and contributes to human health and happiness.



Director, Central Research Laboratory  
Tsutomu Hara

### Review of FY2019

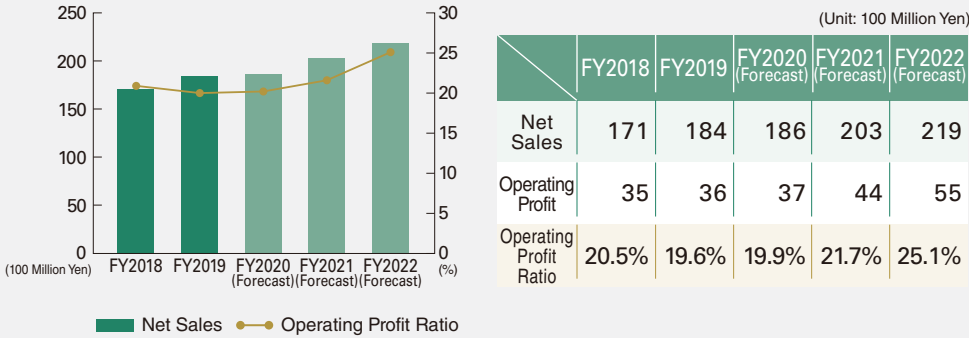
This year has shown that Japan is more interested than ever before in light and light quantum. By promoting efforts that anticipate practical applications and commercialization, our research laboratory participated in the light and light quantum themes advocated by the Cross-ministerial Strategic Innovation Promotion Program (SIP), which strives to realize science and technology innovation. In addition, the Central Research Laboratory became involved in quantum simulator with a quantum computer project that began in 2019 and helped with long-term fundamental research. Another major success, was our development of an industrial pulsed laser system which output the world’s highest pulse energy of 117 joules (J).

### For Future Growth

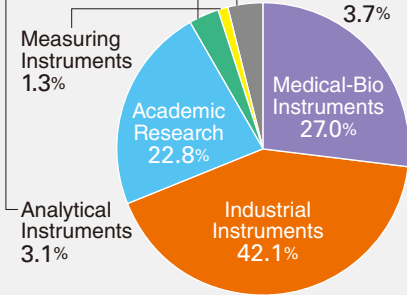
I feel that long-term research with vision has dwindled compared to the past. I am thinking about how we can create a system to find interesting, long-term research themes. To realize this system, the Central Research Laboratory will instill our long-valued research principles through organizational restructuring and other measures. We will also put every effort into the development of the human resources to whom we will entrust the Central Research Laboratory in the future.

## Data

### ▼ Consolidated financial results by business segment



### ▼ Sales ratio by industry and application (FY2019)



## Laboratories



▲ Tsukuba Research Center, Central Research Laboratory



▲ Industrial Development Center, Central Research Laboratory

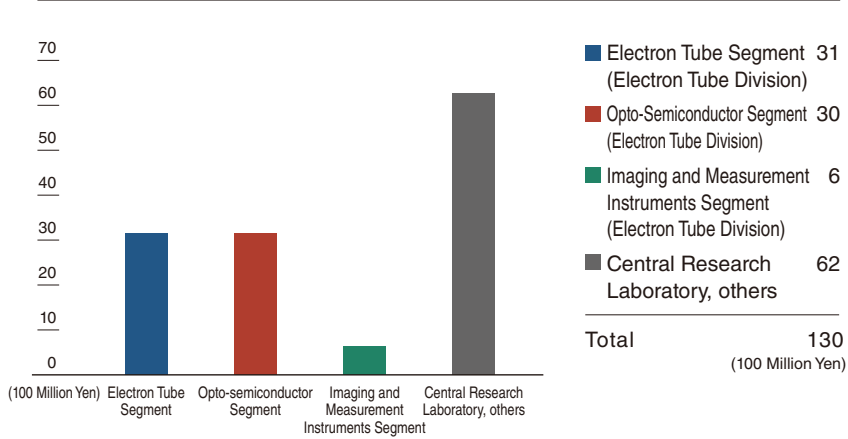
◀ Central Research Laboratory



# Research and Development

Hamamatsu Photonics conducts research and development under the main theme of research and applications related to the nature of light. Each division engages in the research and development of products, their applied applications and the element, manufacturing and processing technologies that support them. The Central Research Laboratory conducts basic research into light and applied research for the use of light.

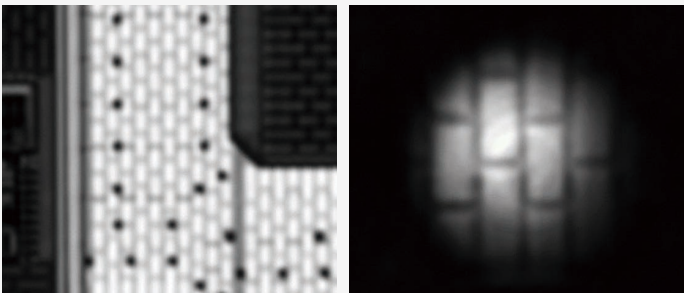
▽ R&D expenses (FY2019)



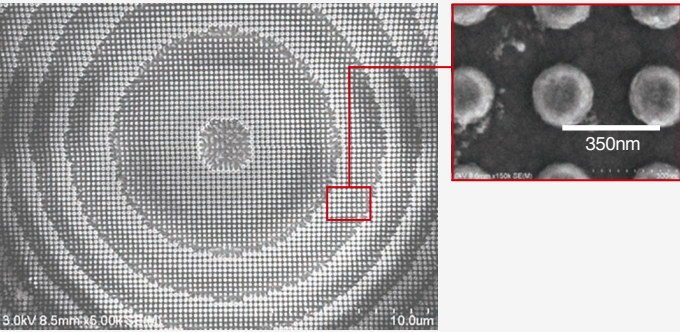
## ■ Examples of FY2019 Research Achievements

### Basic Research ▶ Evolution of Metalens Research and Development to Achieve Thin, Highly Functional Designs

In the optical materials sector, we are pursuing the development of the metalens - a lens capable of controlling the refractive index of light which is unique to each substance. This is made possible by arranging on its surface that are smaller than the light wavelength. The Metalens based on two-dimensional nano-fine structure arrays with varying diameter. The period and thickness of the metalens are smaller than the wavelength of the light. In theory, the metalens can provide increased magnification. However, how to arrange the nano-fine structures was a technical challenge. To overcome this challenge, we leveraged our proprietary processing technology and successfully produced a metalens prototype with arrays of fine silicon pillars on quartz glass. We will seek to put this technology into practical applications and apply it to our products.



▲ Images of a semiconductor device observed with the optical microscope of our failure analysis system for semiconductor devices. Compared to the image on the left, observed without a metalens (observed with a normal lens), the image on the right observed with a metalens shows microstructures in fine detail at high magnification.



▲ Structure (left) and magnified view (right) of a metalens. Silicon pillars are formed and arrayed on the surface of quartz glass at intervals smaller than the light wavelength.

### Product Development ▶ MCP Assembly for Explosive Trace Detectors

Microchannel plates (MCPs) are sensors that detect and amplify electrons generated by ions or X-rays, etc. in vacuum. They are widely used in a variety of analyzers such as mass spectrometry<sup>[1]</sup>. In recent years, small detectors, using mass spectrometry technology have been developed to improve the accuracy of explosive trace detectors used at facilities such as airports. However, due to the downsizing of the vacuum pumps, the decrease in the degree of vacuum inside the detector resulted in increased noise. We have therefore developed an MCP Assembly that operates stably without generating noise, even in low vacuum conditions. This was achieved by adopting our proprietary voltage supply method, and by reviewing the detector structure. Moving forward, we will continue to develop photonics technology that will contribute to the strengthening of security at airports and other similar facilities around the world.



▲ Newly developed MCP assembly

[1] Mass spectrometry is an analytical technique that provides information on the nature, structure and volume of substances contained in a sample by ionizing the atoms and molecules of the sample and measuring their mass.

# Contributions to Academic Research

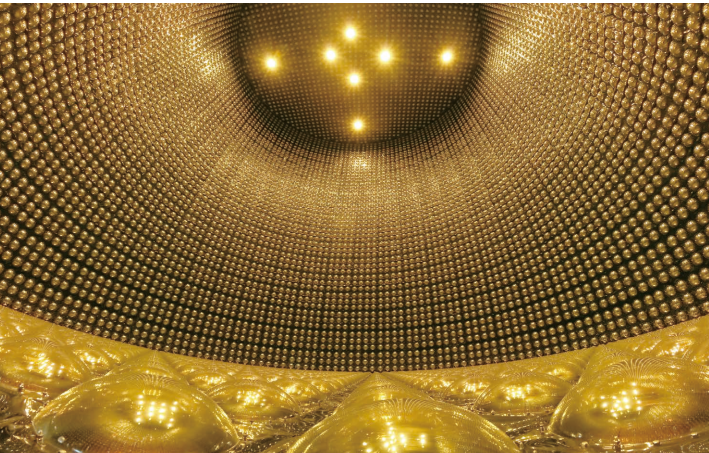
This section introduces academic research projects, the products used in those projects and how they contributed to the advancement of science.

## Neutrino Observation Equipment, Kamiokande, and Super-Kamiokande

On the 23 February 1987, the Kamiokande Neutrino Observatory made an historical achievement. They had the first neutrino observation from a supernova explosion. This, once-in-a-lifetime opportunity triggered by a supernova 160,000 light-years away, was captured by Hamamatsu Photonics' Photomultiplier Tubes (PMTs). Our technology is always evolving and continues to gain attention. We are proud that our PMTs were selected for the upgraded Super-Kamiokande, and for the next Hyper-Kamiokande project.



▲ New 20-inch-diameter PMTs



▲ Inside the Super-Kamiokande



▲ CTA experiment

## Gamma-ray Telescope Experiments to Unravel Unexplained Phenomena

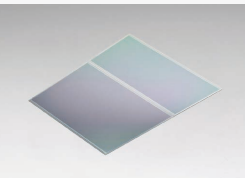
When ultra-high energy gamma rays, traveling through outer space, collide with the Earth's atmosphere, a natural phenomenon that produces many particles called an "air shower" occurs. Observing the Cherenkov light generated from this collision with a gamma ray telescope, makes it possible to measure the source and energy of high-energy gamma rays. This will help find and reveal the workings of various unexplained phenomena in our universe, such as those occurring in the center of an active galactic nuclei, supernova explosions, and gamma ray bursts.



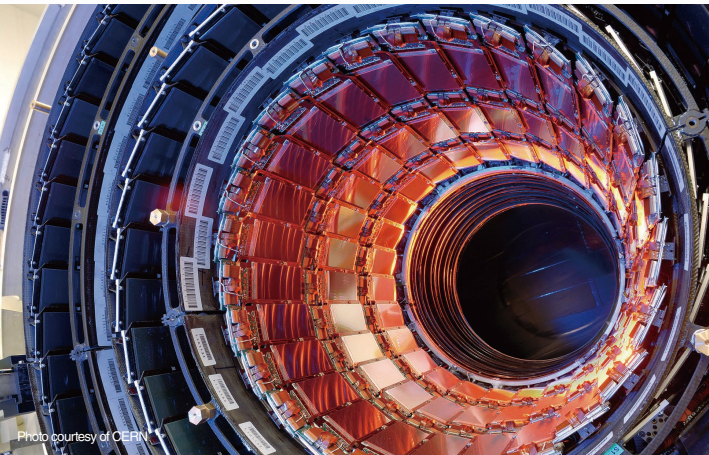
▲ Photomultiplier tube used in the Cherenkov Telescope Array (CTA)

## The collider which detected the "Higgs boson", often called the "God particle", which gives mass to matter particles.

The elusive Higgs boson, often called the "God particle", was only recently discovered and its existence finally confirmed by experiments using the Large Hadron Collider (LHC), the world's largest accelerator measuring 27 kilometers in circumference. Hamamatsu Photonics SSD (Silicon Strip Detectors) contributed to this great discovery. These SSD detected the tracks along which the particles pass, to a resolution of within a few dozen micrometers.

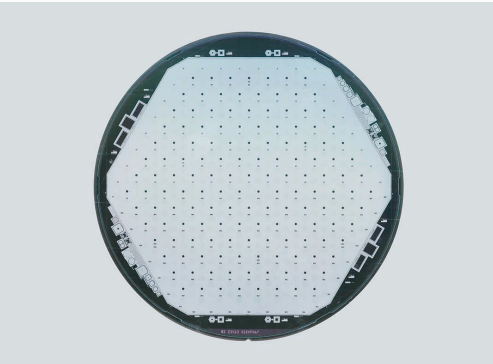


▲ SSD used for "Higgs boson" detection



▲ SSDs installed in the CMS tracker at CERN's LHC

In August 2019, CERN (the European Organization for Nuclear Research) announced that it had decided to sign contracts with us to purchase our silicon sensors for the next phase large hadron collider, the HL-LHC. The ATLAS and CMS trackers of the HL-LHC will use three types, about 75,000, of silicon sensors.



◀ 8-inch pad detector, one of three types of silicon sensors



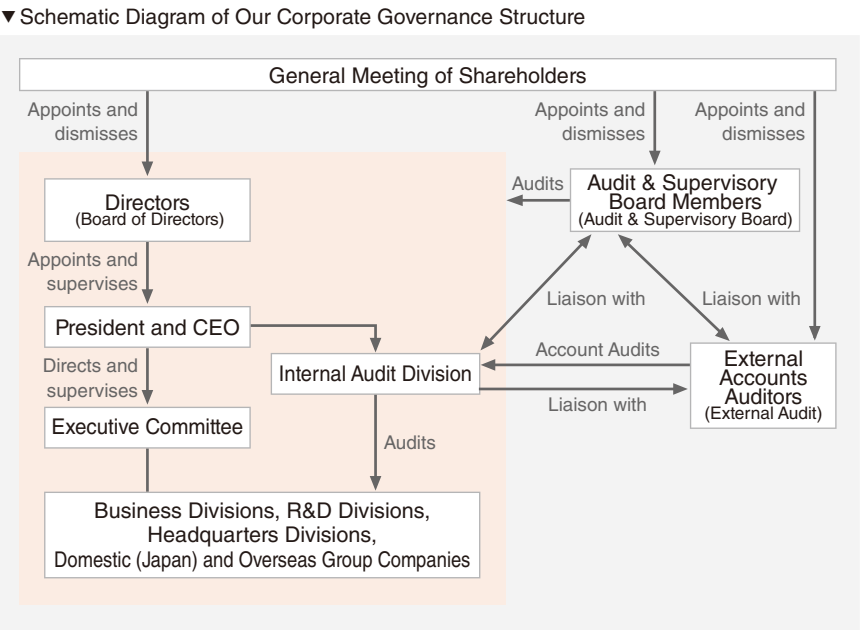
Activities for Governance

# Foundation of Hamamatsu Photonics

## Supporting the Pursuit of the Realms of the Unknown and Unexplored

### Significance of Strengthening Corporate Governance

Our products are used as key devices that contribute to human happiness and the sustainable growth of society in medical, analytical, industrial and a wide range of other fields. We will enhance our corporate value toward ongoing social contributions in the future. In order to do so, Hamamatsu Photonics formulates and shares its corporate philosophy because all of our employees unified in both action and principle toward the future is indispensable. We believe this can generate stable earnings, furthers research and development, and fosters growth. Therefore, we are building a distinct governance structure suitable for Hamamatsu Photonics.



### Specific Activities

#### ■ Sharing Our Corporate Approach

Research Industry and All Researchers System

Hamamatsu Photonics advocates research and has adopted an all researchers system. This system means that every employee always keeps in mind not only the research departments, but also manufacturing and other indirect departments, with the goal of expanding business operations by sharing an approach that further improves and develops day-to-day operational processes.

Cost and Effectiveness

Hamamatsu Photonics gives independence to each division through a bottom-up approach. We ask each department to work as small organizational units in each division, which act as individual small companies required to balance accounts within each team. Each division operates with a 30% operating profit target across all the affiliated departments. By continuing to operate under this type of structure over the long term, each employee naturally learns a sense of awareness of profitability, which in turn helps ensure profit for the entire company.

#### ■ Corporate Bodies

Company Structure with an Audit & Supervisory Board

Unlike any other industry, Hamamatsu Photonics works in the continued pursuit of light, the majority of which is still unknown. We believe the Board of Directors who lead our company in this pursuit of light should both make decisions and supervise business execution. We have therefore adopted the structure of a company with an Audit & Supervisory Board. However, as a publicly listed company, we have also appointed two outside directors (as of December 2019) to oversee activities through external parties.

#### ■ Dialogue with Investors

We, at Hamamatsu Photonics hope that our shareholders will hold our shares over the long term. For this reason, we actively engage in dialogue with our institutional investors based on our belief that we must facilitate understanding about our businesses. We also advocate the following policies related to our dialogue with institutional investors.

- An IR/SR director is appointed and either the IR/SR director or, an executive, dialogue with investors.
- Multiple departments collaborate and provide a dialogue with investors centered upon the Investor Relations Office under the supervision of the director in charge.
- Individual interviews or small meetings are held each quarter.
- Investor feedback received as an outcome of the dialogue, is appropriately reported to the representative director and executive officers.

### Fruits of Our Efforts

01

We drafted a basic corporate government policy aligned to our management philosophy. We also formulated our basic approach to corporate ethics and compliance, both of which are publicly available.

02

Our net sales are strongly growing, with the consolidated net sales for FY2019 being the highest ever achieved at 145,912 million Yen. The operating profit ratio also successfully reached 17.4%.

03

Hamamatsu Photonics has had no legal violations or company scandals.


04

We held 236 interviews with investors during FY2019.

### Future Challenges and Countermeasures


The challenge is whether we can meet matters deemed necessary in the short-to-mid-term for stakeholders, while also satisfying mid-to-long term requirements. Therefore, Hamamatsu Photonics advances its core technologies such as photodetectors, which are the foundation of its business. Whilst never forgetting the venture spirit held since our founding, planning and endeavoring to develop new technologies, and cultivating the human resources entrusted with these tasks. We share the things we see as important, as well as our values, with all of our shareholders and various other stakeholders involved to build long-term relationships based on trust. In the future, ongoing contributions to society, are directly connected to the perpetual existence of corporate organizations.

▼ For more detailed information about our corporate governance, please refer to the link below.



CSR/ESG Information

<https://www.hamamatsu.com/jp/en/our-company/csr/index.html>



Basic Policy on Corporate Governance

[https://www.hamamatsu.com/resources/pdf/hamamatsu/corporategovernance\\_en.pdf](https://www.hamamatsu.com/resources/pdf/hamamatsu/corporategovernance_en.pdf)



# Financial Data for Seven Years

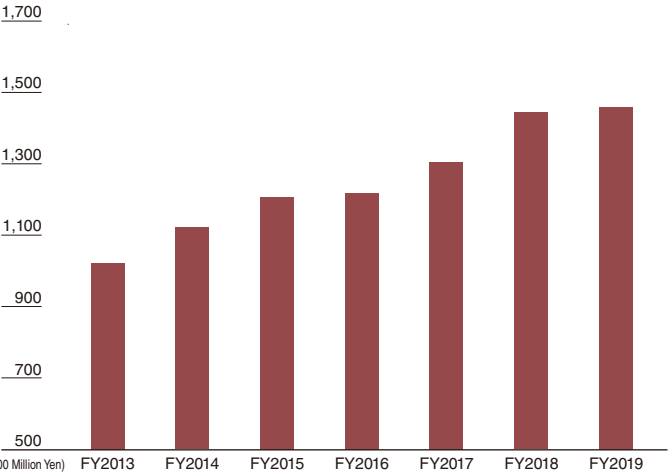
Consolidated Performance Index	FY2013	FY2014
Net sales	102,156	112,092
Cost of sales	50,951	53,451
Selling, general and administrative expenses	23,537	25,998
Operating profit	16,781	21,665
Ordinary profit	17,883	22,531
Profit attributable to owners of parent	11,529	15,155
Capital Investments	9,184	15,499
Depreciation *Tangible fixed assets	7,769	7,396
R&D expenses	10,885	10,977
Cash flows from operating activities	14,688	23,135
Cash flows from investing activities	▲6,493	▲13,677
Cash flows from financing activities	▲4,052	▲4,139
Cash and cash equivalents at the end of period	42,852	49,281
Total assets	198,278	215,412
Equity capital	153,873	168,274
Working capital	38,103	39,855
Number of shares issued (thousands)	83,764	83,764
Operating profit ratio (%)	16.4	19.3
ROA (%)	5.9	7.3
ROE (%)	7.8	9.4
Per share information	FY2013	FY2014
Net income for current period	71.71	94.26
Dividends	25	27.5
Payout ratio (%)	34.9	29.2

\*The results for FY2013, FY2014, and FY2015 are calculated taking into account the 2-for-1 stock split executed in April 2015.

Unit: Million Yen				
FY2015	FY2016	FY2017	FY2018	FY2019
120,691	121,852	130,495	144,338	145,912
57,582	60,807	65,670	70,385	71,916
27,897	28,627	30,199	33,857	35,520
23,596	20,544	22,849	27,263	25,403
24,658	20,050	24,037	28,088	26,277
16,598	14,419	17,777	21,222	19,918
14,338	9,315	13,572	14,221	17,412
8,561	9,888	9,441	10,261	10,950
11,615	11,873	11,776	12,830	13,071
16,046	24,160	26,154	23,579	30,875
▲17,057	4,186	▲13,198	▲8,880	▲16,086
▲4,878	▲15,413	▲5,707	▲16,323	▲6,681
45,556	53,595	63,385	61,824	68,521
226,179	217,300	239,331	244,914	259,694
180,141	169,163	186,939	193,317	202,957
44,699	44,499	51,262	59,031	60,254
167,529	167,529	167,529	165,011	165,011
19.6	16.9	17.5	18.9	17.4
7.5	6.5	7.8	8.8	7.9
9.5	8.3	10.0	11.2	10.1
Unit: JPY				
FY2015	FY2016	FY2017	FY2018	FY2019
103.23	90.23	113.00	136.50	128.67
34	34	34	37	40
32.9	37.7	30.1	27.1	31.1

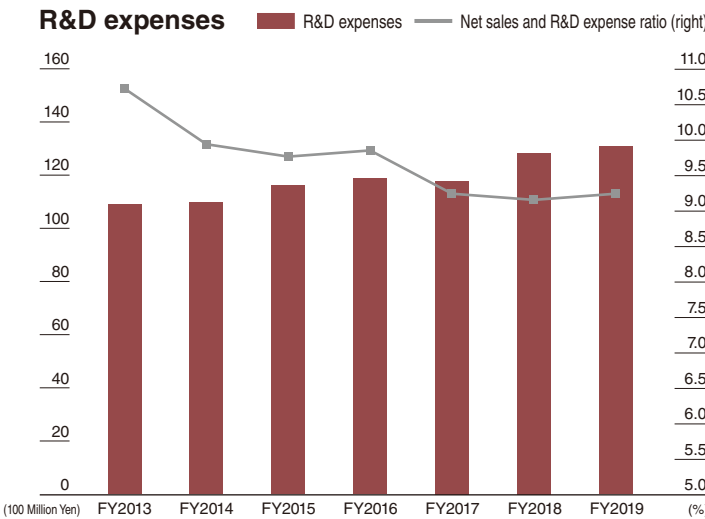
# Financial Review

## Net sales



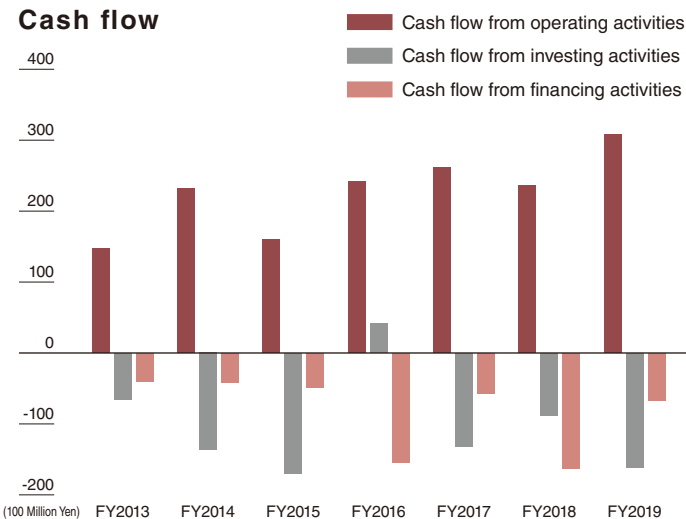
The net sales for FY2019 reached 145.9 billion Yen, which is the highest in the history of our company. The demand for industrial instruments fell due to restrained capital investment worldwide, but our sales increased for medical-bio instruments thanks to a growth trend in markets driven by greater needs for the early detection and treatment of diseases.

## R&D expenses



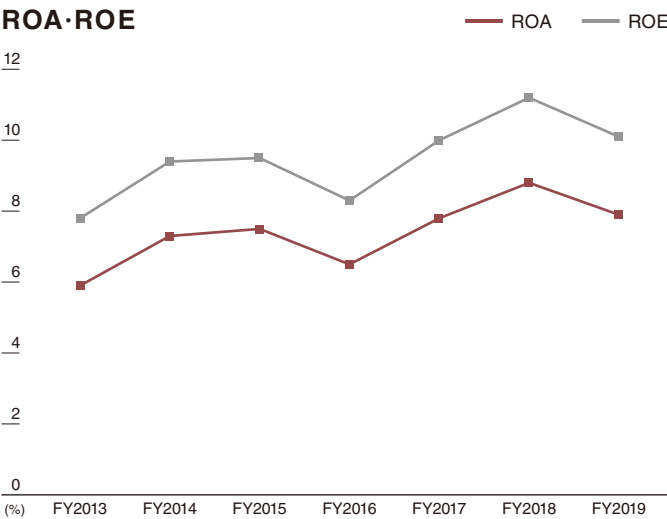
The solidification of core technology by pursuing performance to its farthest boundaries is the foundation of business growth. This is the reason research and development expenditures continue to increase. R&D expenditures for FY2019 reached 13 billion Yen, which is the highest in the history of our company. In the future, we will actively invest in product development and basic research to further strengthen our research and development system.

## Cash flow



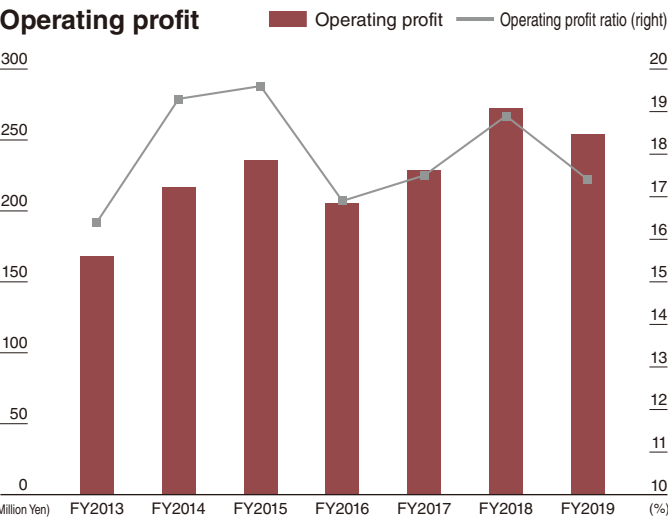
In FY2019, the cash flow from investment activities reached minus 16.0 billion Yen, due to active research and development, in addition to capital investments. However, the free cash flow was 14.7 billion Yen.

## ROA·ROE



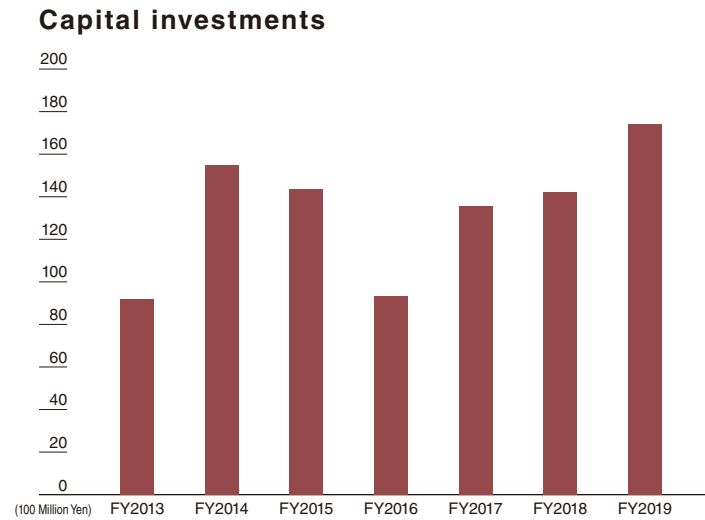
In FY2019, we had a 10.1% ROE (down 1.1% year-on-year) and a 7.9% ROA (down 0.9% year-on-year) due to a fall in profits resulting from the appreciation of the yen and increased expenditure. We will improve ROE and ROA by increasing our profit level.

## Operating profit



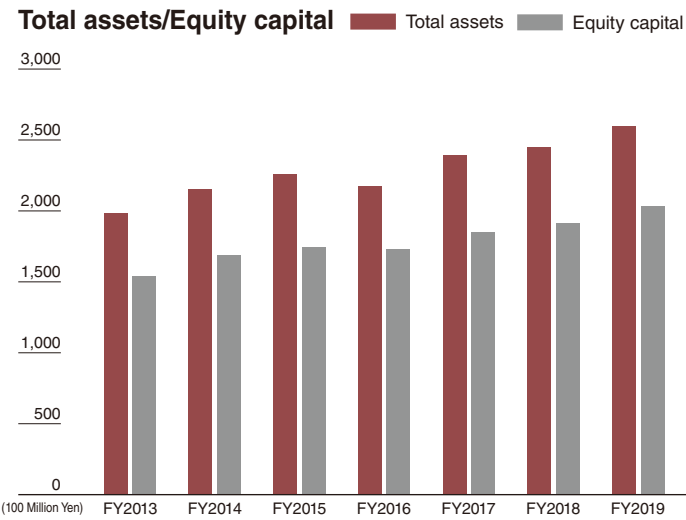
Operating profit declined in FY2019 due to prior investments such as in the compound semiconductor fabrication center, increasing cost of sales staff at overseas subsidiaries and the impact of the appreciation of the yen.

## Capital investments



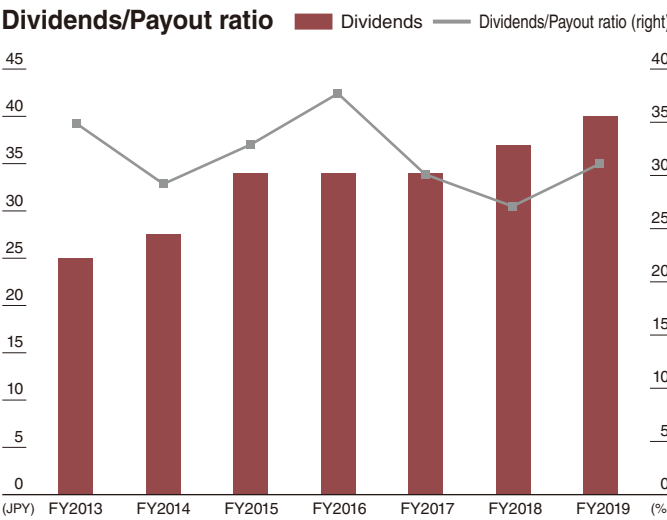
Capital investments in FY2019 reached 17.4 billion Yen for projects that included a new wing for the Opto-semiconductor Segment (in response to growing sales of opto-semiconductor module products). We will continue to make further aggressive capital investments to strengthen research and development, accelerate the expansion of growth products, and heighten production efficiency.

## Total assets/Equity capital



The equity capital for FY2019 increased 5.0% year-on-year to 202.9 billion Yen. We have secured a high standard of a 78.2% equity ratio to ensure stable business continuity and to build a research and development system. Our policy allocates equity capital-to-capital investments and research and development expenditure.

## Dividends/Payout ratio



\*The results are calculated taking into account the 2-for-1 stock split executed in April 2015.

The dividend for FY2019 increased 3 to 40 Yen per company share. We aim for a payout ratio of 30% and are providing returns to shareholders through stable dividend increases.



## Closing Message

This is the first time that we have published an integrated report which combines both financial and non-financial information. Since our inception, we have cultivated a unique corporate culture and grown, together with the development of society while valuing harmony among people. However in the 66 years since its founding, Hamamatsu Photonics has grown into a large family with a total number of employees within the Group in excess of 5,000. I have begun to worry that the corporate culture and philosophy formed at the founding of our company in that small local workshop is fading. That is to say, we must remember that the passion that what we call venture spirit today and all of our employees need to reaffirm the corporate culture and philosophy that has supported our growth until now. In parallel, I feel we have reached a moment at which we must consider what should be done, in the future, to foster sustainable growth.

Global interest in the environment is growing with factors, attributed to global warming, such as increases in abnormal weather and severe natural disasters. There are also greater expectations in respect to improvements in the working environment and promoting the active participation of women, together with concerns about corporate governance resulting from corporate scandals. Environmental, Social and Governance (ESG) factors, must also be taken into consideration in order to achieve sustainable corporate growth.

In consideration of all these factors, we created this integrated report, to incorporate ESG perspectives around an axis of a corporate culture and a history that supports sustainable growth. I hope this report can share the management approach and value, which supports the mid-to-long-term sustainable growth we aim for at Hamamatsu Photonics, with all of our stakeholders and our employees.

This report includes many areas in which we can improve and we will strive to provide even better reporting in the future, through ongoing dialogue with all of you. I look forward to all of your sincere feedback.



Managing Director  
Division Director, Administration Headquarters  
**Kenji Yoshida**

## Board Members

As of December 20, 2019



<b>Kenji Suzuki</b> Representative Director and Vice President Division Director, Electron Tube Division	<b>Akira Hiruma</b> Representative Director and President	<b>Koei Yamamoto</b> Representative Director and Senior Managing Director Division Director, Solid State Division and Laser Promotion Division
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Tsutomu Hara	Managing Director Director, Central Research Laboratory	Kenji Yoshida	Managing Director Division Director, Administration Headquarters
Tadashi Maruno	Managing Director Division Director, Systems Division	Takayuki Suzuki	Managing Director Deputy Division Director, Solid State Division
Naofumi Toriyama	Director Division Director, Business Headquarters	Kazuhiko Mori	Director General Manager, Accounting Division
Hisaki Kato	Director Deputy Division Director, Electron Tube Division	Minoru Saito	Director General Manager, Compound semiconductor Fabrication Center
Kashiko Kodate	Director (Outside)	Ken Koibuchi	Director (Outside)
Hiroshi Mizushima	Audit & Supervisory Board Member (Standing)	Akira Utsuyama	Audit & Supervisory Board Member (Standing)
Yuji Maki	Audit & Supervisory Board Member (Outside)	Saburo Sano	Audit & Supervisory Board Member (Outside)

Corporate Overview (As of September 30, 2019)

Company Name	Hamamatsu Photonics K.K.	Net Sales (Consolidated)	145,912 Million Yen (FY2019)
Established	September 29, 1953	Fiscal Year	October 1 to September 30 the following year
Global Headquarters	325-6 Sunayama-cho, Naka-ku, Hamamatsu City, Shizuoka Prefecture, 430-8587, Japan	General Meeting of Shareholders	December
Capital	34,928 Million Yen	Stock Listing	First Section of the Tokyo Stock Exchange
Number of Employees	3,571 (Non-consolidated); 5,035 (Consolidated)	Securities Code	6965
Main Product Lines	Photomultiplier Tubes, Imaging Devices, Light Sources, Opto-Semiconductor Devices, Imaging Processing and Measurement Systems	Accounting Auditor	Ernst & Young ShinNihon LLC

Affiliate Companies and Organizations (Japan)

Global Headquarters	Hamamatsu City, Shizuoka Prefecture
Factories	Main Factory, Shingai Factory, Tenno Glass Works, Joko Factory, Miyakoda Factory (All Located in Hamamatsu City), Toyooka Factory, and Mitsue Factory (Both Located in Iwata City)
Sales Offices	Tokyo Sales Office, Sendai Sales Office, Tsukuba Sales Office, Chubu Sales Office (Hamamatsu City), Osaka Sales Office, and NishiNihon Sales Office (Fukuoka City)
Laboratories	Central Research Laboratory, Industrial Development Center (Both in Hamamatsu City), and Tsukuba Research Center

Consolidated Subsidiaries

▼ Japan	▼ Overseas
Koso Corporation Takaoka Electronics Co., Ltd. Hamamatsu Electronic Press Co., Ltd. Iwata Grand Hotel	<div>Americas</div> <div>Photonics Management Corp. Hamamatsu Corporation Energetiq Technology, Inc.</div> <div>Europe</div> <div>Hamamatsu Photonics Deutschland GmbH. Hamamatsu Photonics France S.A.R.L. Hamamatsu Photonics Italia S.r.l. Hamamatsu Photonics UK Limited Hamamatsu Photonics Norden AB Hamamatsu Photonics Europe GmbH.</div> <div>Asia/ Other</div> <div>Hamamatsu Photonics (China) Co., Ltd. Hamamatsu Photonics Taiwan Co., Ltd. Beijing Hamamatsu Photon Techniques Inc. Hamamatsu Photon Medical Technology (Langfang) Co., Ltd. Hamamatsu Photonics Scientific Instrument (Beijing) Co., Ltd. Hamamatsu Photonics Israel Ltd.</div>

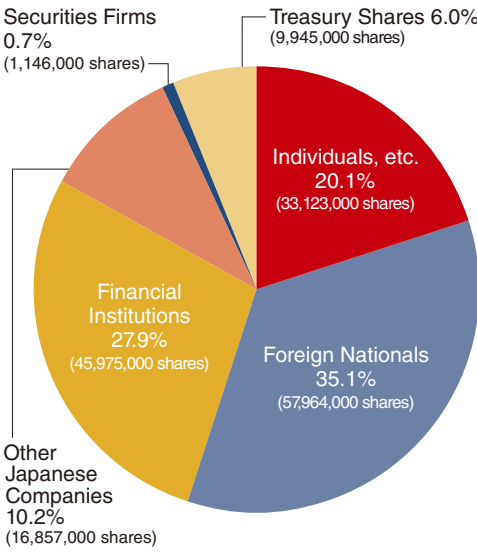
Stock Information (As of September 30, 2019)

Total Number of Authorized Shares (Common Stock)	500,000,000
Number of Shares Issued	165,011,568 (Including 9,945,363 shares of treasury shares)
Number of Shareholders	22,263
Transfer Agent and Registrar	Sumitomo Mitsui Trust Bank, Limited

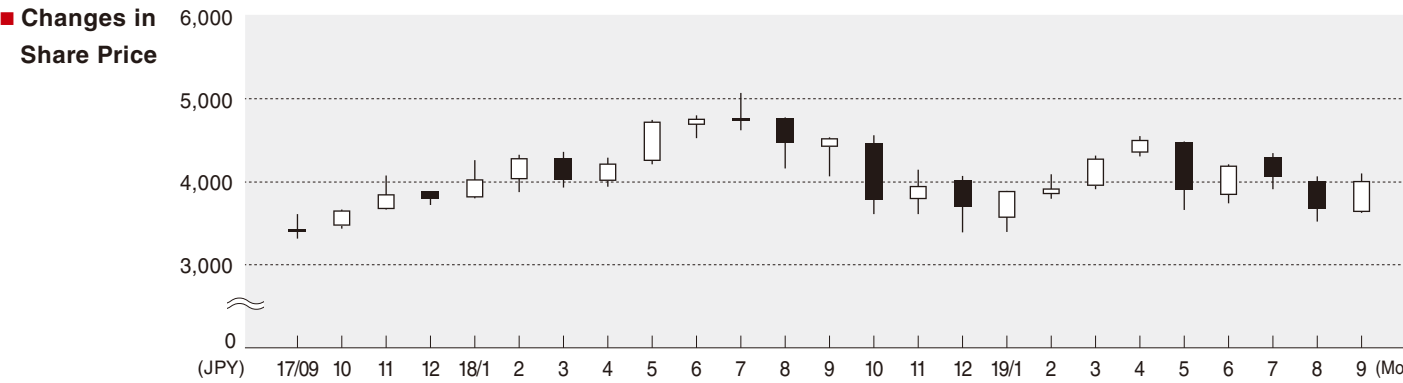
Name	Shares Held	Percentage of Total Shares Outstanding
The Master Trust Bank of Japan, Ltd. (Trust Account)	11,846,700	7.6%
Toyota Motor Corporation	8,400,000	5.4%
Japan Trustee Services Bank, Ltd. (Trust Account)	6,339,400	4.1%
Japan Trustee Services Bank, Ltd. (Trust Account 9)	5,059,100	3.3%
Hamamatsu Photonics K.K. Employees	4,684,114	3.0%
The Nomura Trust and banking Co., Ltd. (Investment Trust)	3,404,700	2.2%
SSBTC Client Omnibus Account	2,966,791	1.9%
JP Morgan Chase Bank 385632	2,951,386	1.9%
Japan Trustee Services Bank, Ltd. (Trust Account 5)	2,873,000	1.9%
JP Morgan Chase Bank 380055	2,699,120	1.7%

Note: 1. The company holds 9,945,363 shares of treasury shares excluded from the shares of the major shareholders listed above.  
2. The percentage of total shares outstanding is calculated by excluding the treasury shares. Units less than that shown above are rounded off.

Distribution of Shares by Shareholder



There is no information relevant to matters such as share options of the company.



For information about this report, please refer to the links below.



Financial Information

<https://www.hamamatsu.com/jp/en/our-company/investor-relations/financial-information/index.html>



CSR Information

<https://www.hamamatsu.com/jp/en/our-company/csr/index.html>



Product Information

<https://www.hamamatsu.com/jp/en/product/index.html>





**HAMAMATSU PHOTONICS K.K.** [www.hamamatsu.com](http://www.hamamatsu.com)

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Investor Relations Office

[ MAIL ] [ir-inf@hq.hpk.co.jp](mailto:ir-inf@hq.hpk.co.jp)

[ TEL ] (053)452-2141

[ FAX ] (053)456-7889

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