

# Society 5.0 for a brighter future

With Society 5.0's goal for humans to live longer, healthier and happier lives, advancements in healthcare, and particularly in the area of oncology, will be of paramount importance.



"We will contribute to achieving the goals of Society 5.0 by providing effective cancer treatment"

Yoshihiro Arai, president & CEO,  
Solasia Pharma K.K.

In its Fifth Science and Technology Basic Plan, the Japanese government laid out its roadmap for the future of the nation, outlining its plans to create Society 5.0, "a human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space."

Up to now industrial and social revolutions have existed separately from each other, taking place at different points in history. However, under Society 5.0, the industrial/economic development will merge with societal change, where the latest Industry 4.0 technologies, such as Internet of Things (IoT), Big Data, artificial intelligence and robotics, will be deployed to improve livelihoods, solve environmental issues and reduce social inequality.

Drawing on the nation's technological prowess, Japan aims to turn Society 5.0 into a reality, incorporating these new technologies at all levels of industry, business and social life in order to achieve both economic development and solutions to a broad range of societal issues.

One of these major societal issues, and thus an important pillar in the Society 5.0 plan, is related to the impact of Japan's rapidly aging society on the healthcare system. Japan has the fastest-aging population in the world, which brings about unprecedented challenges in healthcare. It is many ways a double-edged sword, as there are more elderly people requiring care, but fewer workers to look after them as the Japanese population also shrinks. This has led Japan to search for novel solutions, such as the incorporation of AI, Big Data and robotics to assume the roles of human workers in healthcare – for example using robots to ease the on-site burden of healthcare and care giving.

With Society 5.0's goal for humans to live longer, healthier and happier lives, advancements in cancer treatment in the area of oncology will be of paramount importance. Another consequence of Japan's aging demographic is increasing levels of cancer in society. Therefore, Japanese companies, already at the forefront of oncology internationally, will be instrumental to the success of Society 5.0.

"Building a brighter future for society has always been a part of the concept of our company, as our main mission is 'Better Medicine for a Brighter Tomorrow'. We will contribute to achieving the goals of Society 5.0 by providing effective cancer treatment," says Yoshihiro Arai, president and CEO of bio-tech firm, Solasia Pharma K.K.

"Cancer has been the major cause of mortality in Japan. Everyone wants to have a new medicine to cure cancer, while it is actually really hard to cure. Solasia, therefore, would like to have the opportunity to contribute to society by focusing on development in the field of oncology."

Since its establishment in 2006 to develop innovative drugs in the area of oncology for the Japanese and Asian markets, Solasia has a wide range of products varying



from pharmaceuticals for cancer therapy to supportive care for the adverse effect of drugs.

Over the past 14 years, the Tokyo-based company has invested and concentrated in just five product pipelines: Sancuso (SP-01, for Chemotherapy Induced Nausea and Vomiting), Darinapsin (SP-02, for Peripheral T-Cell Lymphoma), Episil (SP-03, for Pain-Associated Oral Mucositis), PledOx (SP-04, for Chemotherapy Induced Peripheral Neuropathy) and Arfolitoxin (SP-05, for Increased Efficacy of Fluorouracil). SP-01 and SP-03 have already been launched in China and Japan, while SP-04 and SP-05 are at Phase III studies in the US, Europe and Asia (representing Japan). SP-02, for which Solasia has exclusive rights worldwide, is currently being prepared for New Drug Application filing in Japan and other Asian countries.

"Currently, there is no available drug to prevent or treat Chemotherapy Induced Peripheral Neuropathy (CIPN). Our product, SP-04 (PledOx), is currently on the most advanced development Phase III stage among developing agents in the world," explains Mr. Arai.

"SP-05 is our exciting most recent product. It can directly act on tumor cells, unlike levofolinate and folinate products currently available, which need several steps of metabolism to form the final active metabolite."

Driven by its high success ratio in development, this young, agile and innovative bio-venture firm – the only of its kind that can cover both Japan and China – has grown quickly and investors and potential partners, both in Japan and abroad, have taken note. Finding the right partners will be crucial for Solasia to bring its innovative cancer treatment drugs beyond Asia to the US, Europe and Latin America.



# Delivering monozukuri quality through the spirit of co-creation

Leveraging on collaboration and co-creation, Yokohama Yushi Kogyo develops superior quality chemical and oil-based products used across a wide range of industries, from automotive and electronics to functional foods and cosmetics.

Strong, agile and technology savvy, Japan's SME manufacturers form the backbone of the nation's industrial sector, working hand-in-hand with the larger auto and electronics manufacturers like Toyota and Sony to export the high-quality products for which Japan is renowned.

In fact, this culture of co-creation and co-operation has been fundamental to the business success and technological prowess of Japan's SME manufacturers. Japanese concepts such as *Kaizen* and *Monozukuri*, core Japanese manufacturing philosophies based on high-quality, innovation and customer satisfaction, were first extolled by Toyota and then incorporated by smaller firms like Yokohama Yushi Kogyo that supplied products, parts and components for the automobile industry.

"Collaboration and cooperation between small and large companies is characteristic of Japan, this relationship benefits both parties to further develop and grow," says Yokohama Yushi Kogyo president, Hideo Honda.

Established in 1929, Yokohama Yushi Kogyo started out as a refiner of fish oils, before later developing its technology and applying it to the automotive chemical sector. Since then, the company has continued its journey as a chemical R&D-oriented manufacturer, supplying environmentally friendly



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Hideo Honda, President, Yokohama Oils & Fats Industry Co., Ltd.

oil and chemical-based products to the automotive, electronics, food, cosmetics and healthcare industries.

"We absorbed, improved, and implemented the Total Quality Control (TQC) standards that came from the USA. Toyota was the pioneer in the field of TQC and then SMEs took it as an example to improve their systems always with the central mindset of achieving the best quality for customers and developing a mutually beneficial relationship," explains Mr. Honda.

"From Japan we have imported foreign elements and adapted them to elements of our own culture – for example, *Kaizen*, which focuses on striving to improve the lean manufacturing formula that was imported from the US and is now present in all the organizational structures of Japanese companies."

Yokohama Yushi Kogyo's eight core technologies – emulsification, water solubilization, oil solubilization, dispersion, solubilization, oil coating, powderization, and surface modification technology – have been developed thanks to the dedication and effort of its R&D department, which has also formed partnerships with leading Japanese universities and research institutions in the spirit of co-creation.

Moving forward, the company is leveraging on its R&D and innovation capacities to develop new products, with a focus on the functional food, cosmetics and electronics industries, while also continuing to expand its core traditional cleaning agents and automotive chemical segments.

With the growth in health-conscious consumers across the globe, the functional food and beverage market is expected to grow 8.49% CAGR through 2026, and thus offers significant opportunities for Yokohama Yushi Kogyo as it looks to expand its international presence by providing its technologies to larger manufacturers of end-user products.

"Our contribution to the food industry is vital for us; 20% of our business in the food industry is the processing of functional foods. This field is booming as we are more concerned about our health," says Mr. Honda.

"There are foods that have ingredients our body cannot absorb because they are still in an insoluble state. We process water-insoluble materials to soluble formulations by emulsification technology. We also use this technology in the field of cosmetics so that the ingredients are better absorbed by the skin, while the pharmaceutical field is also a key one for our expansion."

From the perspective of technological development, one of Yokohama Yushi Kogyo's key advantages is the fact that it does not distribute products as an ODM (original design manufacturer) to larger firms, but rather produces the technologies and the processes behind these larger companies' end products. "As such we do not focus on the sales and marketing side of the company, we invest our know-how and energy in mid-line processing," adds Mr. Honda.

"There is a co-dependent relationship in terms of distribution with these large companies because wherever they decide to produce, we will go and set up our office there as well. In that sense, the history of our company is based on our ability to leverage the *Monozukuri* process of Japan and take it with us to any market we go to."

**Linda** Yokohama Yushi Kogyo for precision cleaner products and car chemical products  
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# Bridging medicine and engineering

As the world enters the era of Society 5.0, which aims to harness the potential of the latest Industry 4.0 technologies to create a better, healthier and more sustainable future for citizens across the globe, the medical industry will undoubtedly play a vital role.

The latest innovations in the medical industry are being driven by elements such as Big Data, IoT, nano-technology, sensor

to assist in extremely delicate surgical operations, was deployed in the world's first robot-assisted high-precision supermicrosurgery.

Such milestone technological achievements in supermicrosurgery pose major opportunities for Japanese firm, Kono Seisakusho, which has been meeting the ever-changing demands of the medical surgery sector for more than 50 years.



Kono Seisakusho's Tsukuba plant

technology, ultra-precision micro-machining and advanced robotics. And microsurgery is one area that is set to experience rapid technological advancement over the coming years. Thanks to evolving technology in microscopes and instruments, micro-surgeons can now carry out supermicrosurgery by connecting vessels with a diameter of between 0.3 and 0.8mm for the reconstruction of lymphatic flow and vascularized tissue transplantation.

With the limited precision and dexterity of human hands somewhat limiting performance, deploying robots to assist with supermicrosurgical procedures has become a major focal point for researchers. In fact, in February, "MUSA", a robot developed by two Dutch universities

"There is still a lot of potential for growth in microsurgery and robotic surgery," says Kono Seisakusho's enthusiastic president, Junichi Kono. "As this field continues to grow and have various needs over time, there is constant opportunity for us. And our product development goals have increased accordingly."

Using its state-of-the-art micro-machining technology, Kono Seisakusho manufactures suture needles of the highest quality required for supermicrosurgery. Under its reputed CROWNJUN brand, Kono Seisakusho has developed the smallest suture needles in the world at 0.8 mm in length, as well as the accompanying micro-nylon suture thread.

Tried and trusted by microsurgery professionals across Japan, these superior quality micro-suture needles are used in a wide range of procedures, including

blood vessel and nerve reconstruction, perforator flap surgery, breast reconstruction, hepatic arterial anastomosis, transplant surgery, liver transplantation and digital replantation.

"We are striving to raise recognition of CROWNJUN as a brand that offers unparalleled quality products. Each of our products demonstrates the highest possible value," says Mr. Kono.

More than 15 years on since it won the Monozukuri Grand Prize for developing the world's smallest needle for microsurgery, Kono Seisakusho is now seeking overseas approval and partner distributors to bring its high-quality, "Made in Japan" suture needles to operating theatres across the globe – while continuing to develop ground-breaking products that will one day be used in the robot-assisted supermicrosurgical procedures of the future.

"From a technical standpoint, our greatest strength is our ability to build the machines necessary to develop highly specialized medical products. We are able to take the quality of existing machines to the next level. As such, we can go further and create devices that take our products to the next level," says Mr. Kono.

"Our product development focuses on the development of particular materials, as well as raw materials that can be utilized in the medical and surgical fields. For example, our needles are made of incredibly strong and rigid steel. Another material, called PTFE, is a very unique material, which can be used for making artificial artery and tissue implants."

Indeed, key to Kono Seisakusho's success in product development is what it calls "Medical-Engineering Collaboration". Working hand-in-hand with medical doctors, as well as other companies, to develop new technologies, Kono Seisakusho will continue to serve as a bridge between medicine and engineering to meet the medical needs of Society 5.0.

"We go to great lengths to meet current needs and contribute to the development of medical technology



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Junichi Kono, President,  
Kono Seisakusho

in order to support the lives of as many patients as possible," concludes Mr. Kono. "That is what we at Kono Seisakusho believe to be our mission."



# Asahi Intecc: leading medical device innovation

**A leading developer of ultra-precision wire technology for vascular treatments, Asahi Intecc continues to create innovative medical devices trusted by doctors worldwide.**

While many people would not associate the production of wires with the medical industry, instruments such as guide wires, guiding catheters and balloon catheters are indispensable in the field of catheter treatment, which is one of the methods of treatment for diseases such as angina pectoris and myocardial infarctions that are caused by the heart's blood vessels becoming clogged or narrowed by cholesterol.

With catheter treatment often involving wire products with diameters as thin as 0.35mm, it is needless to say that medical professionals require the highest quality, high performing and high precision wire products – which is why many turn to the global leading technology developed by Asahi Intecc.

For almost three decades, Asahi Intecc has been positioned as a vital cog in the medical device industry, supplying products such as guide wires, guiding catheters and balloon catheters, as well as ultra fine stainless steel wire ropes for industrial and medical use, to clients in Japan and across the world.

While Japan has lead the way in many technological fields, it has somewhat trailed behind Europe and the US in the field of medical devices. As such, Asahi Intecc has gained growing attention from medical professionals worldwide, and today counts Boston Scientific among its co-development partners.

Such attention has been garnered thanks to Asahi Intecc's ability to stand ahead of the competition with its competitive advantages stemming from its attention to high-quality, fully-integrated production model, advanced production knowhow based on its four proprietary core technologies, as well as its close collaboration and joint R&D with medical professionals to develop new products. These excellent development capabilities and production technologies have enabled Asahi Intecc to gain a high global market share in the medical device field.



**"We have enhanced our system of joint R&D with top doctors in various fields"**

Masahiko Miyata, President & CEO, Asahi Intecc

"In recent years we have enhanced our system of joint R&D with top doctors in various fields that have ample experience in the medical front line. Thereby we are developing products in close connection to medical practice," explains company president and CEO, Masahiko Miyata.

"We are convinced that we can contribute to the development of medical care by proactively promoting collaboration with top doctors not only in Japan but also all over the world by providing innovative products."

In response to market needs, Asahi Intecc also plans to expand beyond vascular treatment into the fields of gastrointestinal organs and robotics, where there is potential to utilize its existing core technologies, while also focusing on strengthening its development system for these new areas.

Asahi Intecc possesses four core technologies necessary for wire manufacturing: wire drawing technology, wire forming technology, coating technology and torque technology; while its in-house integrated production (from procuring raw materials to manufacturing finished products) ensures a stable supply of high-quality products. This type of integrated production system is rare for a medical device man-

ufacturer, which is why Asahi Intecc's products stand out from the competition.

"In particular, our torque technology can accurately convey the feeling of the doctor's fingertip to the tip of the guide wire, achieving excellent operability that other companies cannot imitate," says Mr. Miyata.

As Asahi Intecc's sterling reputation has grown worldwide, the Tokyo Stock Exchange listed company has expanded its collaboration with global development partners. It has started joint development with Boston Scientific on Fractional Flow Reserve (FFR) wires.

Using embedded sensors that measure the pressure gradient of blood flow around the coronary artery, FFR wires determine how much blood flow is being inhibited and the severity of a lesion caused by stenosis (a blockage or narrowing of the arteries). "This measured index gathered

from using FFR is excellent for its cost-effectiveness and at the same time decreases the rate of MACEs (major adverse cardiac events) per year," explains Mr. Miyata. "Thanks to this collaboration our products are used in a large number of hospitals in the United States; we have obtained recognition and at the same time, we make it easier for doctors to do their work."

With its target to increase revenues from the current 56 billion yen to 100 billion yen (approx. \$940 million), Asahi Intecc aims to develop groundbreaking new medical device technologies incorporating AI, GPS technologies and robotics. Meanwhile, the company has expanded and diversified the industrial arm of the business, with its high-quality wire products being deployed in the production of automobiles, golf shoes, fishing lines and air conditioners, to name a few.

**Your dreams. Woven together.**  
**ASAHI INTECC**  
www.asahi-intecc.co.jp/en

# Merging AI technology and human interaction

Culture has had a lot to play in differing perspectives on the concept of robots. While Western science fiction and literature has created a level of fear and apprehension in the US and Europe, the reverence for robots in Japan mainly stems from the popularity of 'Karakuri Ningyo' – mechanized dolls that first appeared in the 17th century during the Edo Period. Moreover, traditional Shinto and Buddhist teachings in Japan say that a soul or spirit resides even in inanimate and manmade objects, which could also partly explain the nation's love, respect and admiration for machines.

It's no wonder then that Japan is leading the robotics revolution that sets out to build a better society and economy, where AI will open up once unthinkable possibilities across the board, while robots will take over menial and dangerous jobs, deliver our food, and offer companionship and care to the elderly. And several Japanese companies, like donut robotics, are already at the forefront of creating new synergies between AI technology and human interaction to create a better and more comfortable future.

"We believe that 30 years from now all the dangerous jobs for humans will be occupied by robots," says donut robotics

CEO, Taisuke Ono. "We have continued to develop robots under the theme of 'Solving Social Problems' and 'Creating a New Platform'. By 2050, we want to change the world with conscious



"We have continued to develop robots under the theme of 'Solving Social Problems' and 'Creating a New Platform'"

Taisuke Ono, CEO, donut robotics

humanoid robots. We will do our best to serve society by developing as much as possible."

Like Steve Job and Steve Wozniak's Apple in its early days, donut robotics was founded in a garage by an ambitious group of engineers and designers. And Mr. Ono hopes to follow Apple's trajectory to the top by focusing not only on superior technology, but also marketing and design.

"Our competitive advantage is based on the fact that apart from being leaders on soft and hard technological expertise, we focus on packaging, price, design, as well as the technological aspect," he says. "We aim to have a prestigious branding image – to become the Apple of robotics."

After Mr. Ono and his colleagues first generated crowd-funding to develop a prototype for their smart robot, known as Cinnamon, a venture capitalist

in Fukuoka was the first big investor to support the company, which has since listed on the Tokyo Stock Exchange and now counts Hitachi, NTT, and Mitsui Group among its partners.

Most investors were initially made aware of donut robotics when the new Cinnamon prototype was selected to be deployed at several Japanese airports in 2017 to support human airport staff. With the capacity to deal with customers, offer translation services, watch over infants, the elderly, and pets, as well as offer health checks; today Cinnamon is not only used at airports, but also at public facilities, corporate offices and homes across Japan.

## C-Face Smart Mask

As is the case for many top innovators like donut robotics, crises can bring about new opportunities. In response to the coronavirus pandemic, the company focused its efforts on developing a smart mask prototype called the C-Face Smart Mask, which is designed to make communication and social distancing easier. Connecting with an app easily downloaded to a user's cell phone, the C-Face Smart Mask can transcribe dictation, amplify the wearer's voice, and translate speech into eight different languages.

Of course, like robots, hygienic masks have historically been much more commonplace and accepted in Japan -- that was at least until the onset of the coronavirus crisis. But with the

proliferation of masks across the Western world, coupled with a growing acceptance of AI and robotics, Mr. Ono sees ample opportunity for products like the C-Face Smart Mask.

"In a society where we are asked to wear a mask to avoid infections, using a mask that ensures the flow of communication and avoids misunderstandings is a key opportunity. The materials used are germ-free and by wearing another protective mask underneath it, the hygiene level remains intact," he says.

With a focus on reaching English-speaking markets first, donut robotics aims to launch the C-Face Smart Mask in Europe next year, followed by Japan at the end of the year, with the unit expected to retail at a around \$44. "Eventually everyone will be able to buy it through Amazon. But essentially, at the moment, we are interested



in selling the software rather than the masks themselves," says Mr. Ono, whose ambition for the future is to collaborate with the likes of Facebook and Google and build "a company with \$1 billion market capitalization" over the next five years.



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# Building blocks of a better world

Mitsubishi Gas Chemical is leading development of vital chemicals, compounds and materials for the technologies that will drive Society 5.0, as well as green energy and carbon recycling.



"When looking at the elements required to tackle global issues it comes down to the role that chemicals can play"

Masashi Fujii, President,  
Mitsubishi Gas Chemical

From 5G and 6G communications technologies, robotics, aerospace and autonomous vehicles, to healthcare, smart agriculture and green energy development, the role of the chemicals and materials science industries in the advancement of Society 5.0 cannot be understated.

Virtually all the latest products and technologies in the aforementioned fields depend on materials and chemicals developed by global leaders like Mitsubishi Gas Chemical (MGC), which, for five decades, has strived to create original technologies for the betterment of society.

And with the company preparing to celebrate its 50th anniversary in 2021, MGC has identified four key pillars in its dynamic mid-term strategy to meet the needs of Society 5.0: energy, information/ communication, medical/ food, and mobility.

MGC's product portfolio includes basic chemicals like methanol, xylene, and hydrogen peroxide, high-performance engineering plastics, foamed plastics and semiconductor packaging materials, as well as life science products, such as antibody pharmaceuticals and

fermented foods – while its high performing resins and polymers are used in the production of autonomous vehicles, fuel-cell batteries and have ample potential in the latest aerospace technologies.

"When looking at the elements required to tackle global issues it comes down to the role that chemicals can play. Innovative trends such as SpaceX exist thanks to chemical companies, from the raw materials to the machinery," explains MGC's President & Representative Director, Masashi Fujii.

"SpaceX is looking to launch 40,000 satellites, which happens to be a gigantic opportunity for us as we are able to manufacture carbon fiber composites of excellent heat-resistance. Aerospace offers us opportunities such as the possibility of moving from 5G to 6G. Regarding the mobility domain, we want to make smart cars (EVs and autonomous vehicles) a reality through providing materials that enable lighter cars, moving on hydrogen and fuel batteries."

Indeed investment in R&D and innovation forms the most vital part of the strategy for MGC. There are currently around 500 researchers working at its three R&D centers in Niigata, Kanagawa, and Tokyo – each of which specialize in different areas, such as organic chemicals, catalysts, biotechnologies, natural-gas derived chemicals and polymers, and market-driven performance chemicals. MGC aims to increase investment in R&D from 5% to 10% of total revenue as it looks to further pioneer advancements in chemicals and materials science.

"Up until now, R&D was mainly done in-house but in the immediate future, we want to undertake the task of creation with partners to unify efforts. We have close ties with several partners worldwide," adds Mr. Fujii.

With 10,000 employees around the globe, in regions such as Saudi Arabia, Venezuela, Thailand, Indonesia and China, MGC already has



MGC's geothermal plant in Akita prefecture

an extensive network of overseas partners and subsidiaries, with 50% of its revenue coming from abroad. As the company looks to increase revenues from 650 billion yen to 1 trillion yen (approx. \$94 billion) over the next decade, it plans to extend its presence in Europe and the US, where it already has four factories.

Another focus area for MGC is meeting the future clean energy needs of Society 5.0, while also developing other initiatives for a greener planet. For example, the company's geothermal plant in North Japan will provide electricity to a "plant factory" to harvest plants and vegetables using geothermal energy, while also being a point for carbon recycling.

"Regarding CO<sub>2</sub> recycling, Europe is leading this field but we are rapidly catching up," says Mr. Fujii.

Under Mr. Fujii's leadership, MGC has and will continue to strengthen the vital pillars of its growth strategy while supporting Society 5.0, regarding energy, communication, food and medicine, and the provision of chemical compounds and materials for the aerospace and the automotive industries.

"We will continue to grow until we look into the eyes of Elon Musk in the race for mobility and aerospace and Tim Cook in the race for information and communication devices," he concludes. "As I always say: 'It is important to take risks in order to make risk your friend.'"



MGC's R&D center in Niigata