

Powering Innovation. Delivering Impact.

A*STAR IMPACT REPORT
RIE2025



Contents

About A*STAR	3
Foreword	4
Economic Impact	5
National Impact	27
Frontier Science	37
Nurturing Talent	44
Looking Ahead	51
Glossary	53



About A*STAR

A global leader in science, technology, and open innovation.

Our Mission

We advance science and develop innovative technology to further economic growth and improve lives. The Agency for Science, Technology and Research (A*STAR) drives mission-oriented research that advances scientific discovery and technological innovation. We play a key role in nurturing and developing talent and leaders for our research institutes, the wider research community, and industry. Our research creates economic growth and jobs for Singapore. As a Science and Technology Organisation, we bridge the gap between academia and industry in terms of research and development. In these endeavours, we seek to integrate the relevant capabilities of our research institutes and collaborate with the wider research community as well as other public sector agencies towards meaningful and impactful outcomes.

Together with the other public sector entities, we develop industry sectors by: integrating our capabilities to create impact with multinational corporations and globally competitive companies; partnering local enterprises for productivity and gearing them for growth; and nurturing R&D-driven start-ups by seeding for surprises and shaping for success. Our research, in addition, also contributes to societal benefits such as improving outcomes in healthcare, urban living, and sustainability. These serve to enhance lives in Singapore and beyond.

Our Vision

A*STAR is a catalyst, enabler, and convener of significant research initiatives among the research community in Singapore and beyond. Through open innovation, we collaborate with our partners in both the public and private sectors, and bring science and technology to benefit the economy and society.

Foreword by Chairman and CEO A*STAR

Singapore invests in research and innovation because it matters to our future. As a small nation with limited natural resources, we have to be able to continually develop new capabilities and opportunities through science and technology, to create economic value, improve lives and strengthen resilience.

The external environment is changing dramatically. The geopolitical and global economic landscape is undergoing fundamental shifts. Artificial intelligence (AI) and convergence science are accelerating scientific discovery and application in unprecedented ways. The global competition for talent, investment and technological leadership continues to intensify. At the same time, the challenges Singapore faces, from healthcare and sustainability to economic competitiveness and national resilience, are becoming more complex and interconnected. Addressing them will require not only strong research capabilities, but also the ability to translate research into solutions, enterprises and opportunities that create value for Singapore.

Sustained investments through successive Research, Innovation and Enterprise (RIE) plans have built strong research capabilities and talent, alongside a growing innovation and enterprise ecosystem. During RIE2025, A*STAR supported this effort by helping enterprises develop new capabilities, strengthening key sectors—including semiconductors, advanced manufacturing and biomedical sciences—advancing frontier research, and nurturing the next generation of scientific and innovation talent.

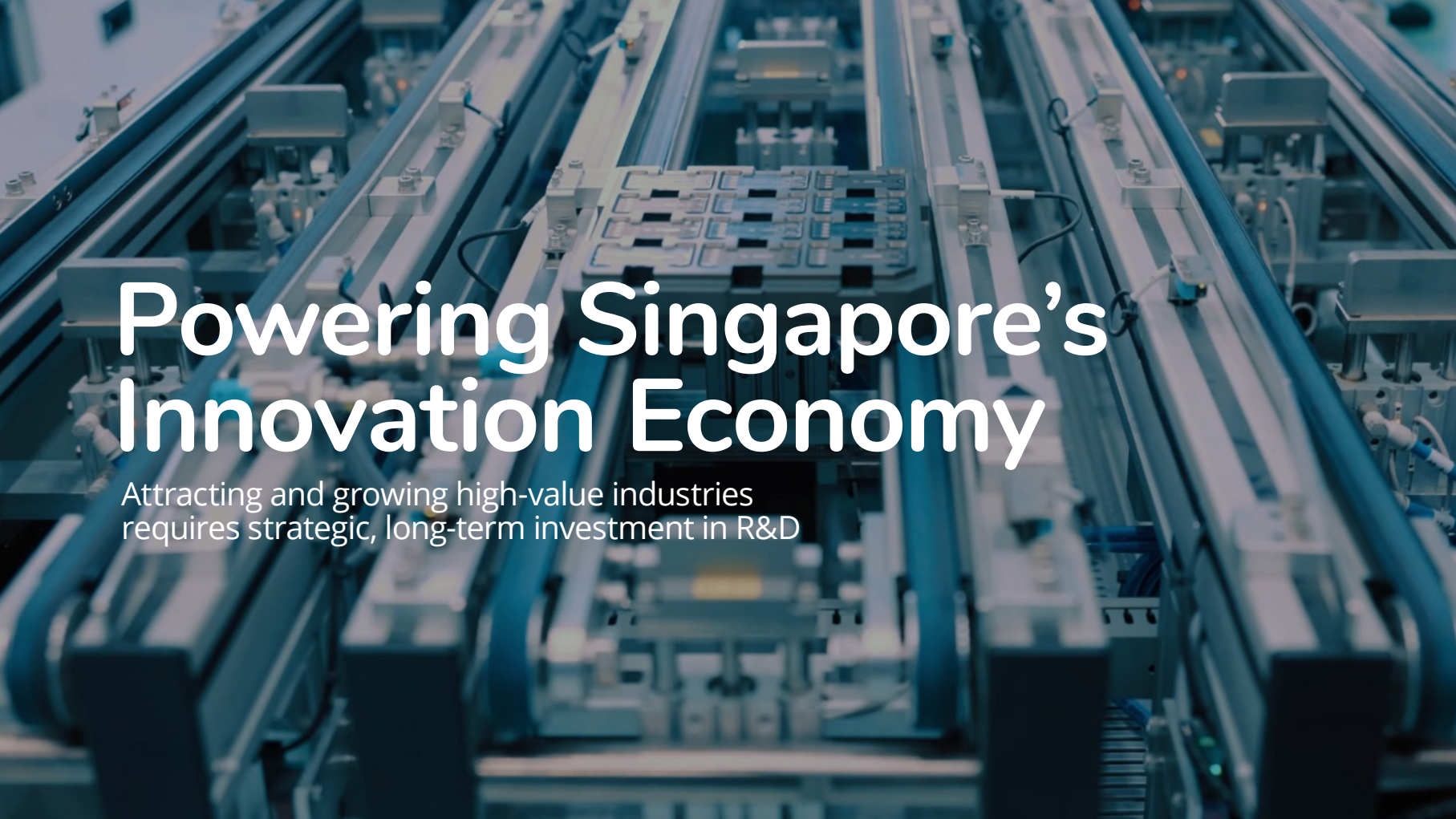
This report highlights how A*STAR contributes to Singapore's economy and national strategic priorities, advances research capabilities, and develops talent. The progress reflected in these pages was made possible by the collective efforts of researchers, engineers, entrepreneurs, industry partners, institutions of higher learning and public sector agencies. Deep partnerships within Singapore and with global partners have been critical in strengthening Singapore's research and innovation ecosystem and creating strong outcomes and impact.

The progress made in RIE2025 has laid solid foundations for the next five-year RIE tranche which has just commenced. RIE2030 will focus on achieving significant outcomes in national economic and strategic priorities, and advancing our data, AI and advanced computing capabilities, while keeping our basic research and talent at the cutting edge. RIE2030 will open up many new possibilities and exciting opportunities. A*STAR will intensify efforts to realise these.



Professor Tan Chorh Chuan
Chairman

Mr Beh Kian Teik
Chief Executive Officer



Powering Singapore's Innovation Economy

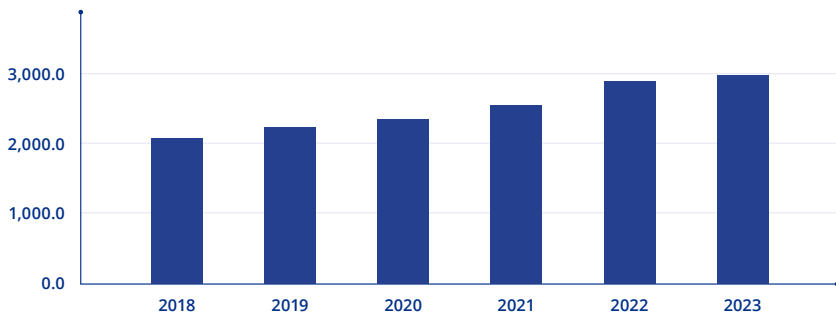
Attracting and growing high-value industries
requires strategic, long-term investment in R&D

Powering Singapore's Innovation Economy

Singapore's ability to attract and grow high-value industries rests on strategic, long-term investment in research and development. Over successive RIE plans, Singapore has built deep scientific capabilities, technical expertise and talent that have strengthened its competitiveness and created new opportunities for growth.

This long-term approach has been particularly important in areas such as semiconductors, biomedical sciences, advanced manufacturing, bioprocessing, modelling and simulation, and increasingly, AI. The capabilities underpinning these sectors were often developed years before market demand became apparent. This is part of a broader, national effect of sustained public investment in research and industry commitment to strengthen Singapore's innovation ecosystem. A*STAR's role has been to build capabilities that translate scientific excellence into economic value. Today, these investments are translating into stronger companies, new ventures and strategic industry partnerships.

Chart 1: BERD Contribution (in S\$mil)



The BERD contributions of companies that collaborated with A*STAR increased from S\$2.1 billion in 2018 to approximately S\$3 billion in 2023—about one-third of Singapore's total BERD. Source: National RIE Survey.

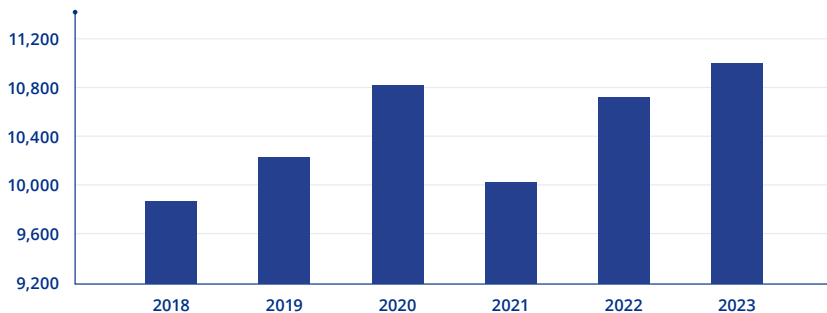
¹ Proxied by R&D manpower employed by R&D-performing private sector entities

The Business Expenditure on Research and Development (BERD) contributions of companies that collaborated with A*STAR increased from S\$2.1 billion in 2018 to approximately S\$3 billion in 2023—about one-third of Singapore's total BERD.

The number of industry R&D jobs¹ created by companies that collaborated with A*STAR rose from 9,875 in 2018 to 11,001 in 2023. The number declined between 2020 and 2021, likely reflecting pandemic-related disruptions that affected survey response rates, before increasing in 2022 and 2023. More than 70% of these jobs were filled by Singapore residents. These indicators point to a broader economic effect. Companies that collaborated with A*STAR increased their research investment and expanded their R&D workforce.

Note: The statistics and data presented in this report reflect the most recent information available at the time of compilation. Due to data collection cycles, some figures may not represent the most current period as certain datasets, including survey results, may have inherent reporting lags. Where applicable, indicators are compared with a reference point five years prior to the latest available data.

Chart 2: Number of Industry R&D Jobs¹



The number of industry R&D jobs created by companies that collaborated with A*STAR rose from 9,875 in 2018 to 11,001 in 2023, with a decrease from 2020 to 2021, likely due to pandemic-related disruptions. Source: National RIE Survey.

Shaping the Future of Manufacturing

As global competition for high-value investments in advanced manufacturing intensifies, companies increasingly choose locations based not only on cost or infrastructure, but on access to talent, R&D capabilities and innovation ecosystems that can support the next generation of products and technologies.

For high-value industries, the decision to invest in Singapore increasingly depends on what can be built, tested and solved in the country. In semiconductors, advanced manufacturing and biomanufacturing, companies need access to technical expertise, specialised facilities, partners and talent that can help them move faster from research to production.

A*STAR contributes to Singapore's competitiveness by translating research into industrial capabilities through close partnerships with global and local companies. These collaborations play a vital role in helping companies innovate, translate research into deployable solutions that improve productivity, build capabilities and drive investment decisions. Sustained R&D capabilities built over many years allow Singapore to anchor these high-value activities and the skilled jobs that come with them.

In Advanced Manufacturing, A*STAR's industry partners accounted for close to:



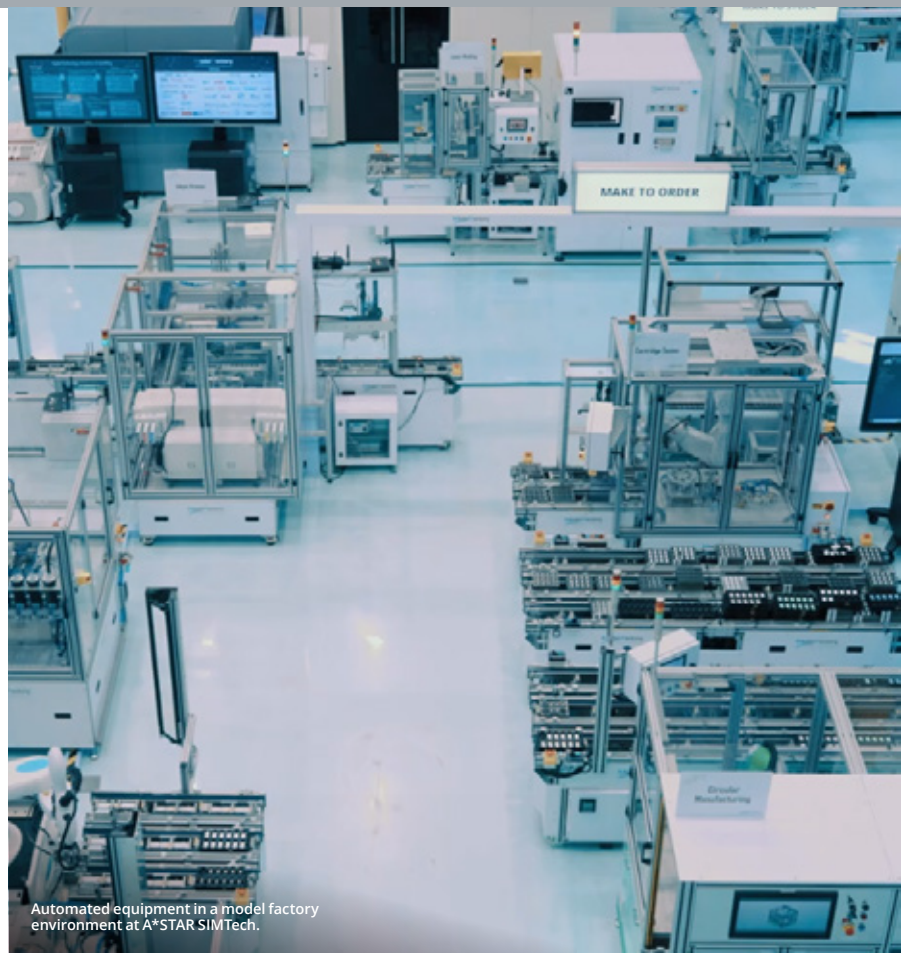
36%
of national manufacturing
BERD in 2023



~S\$1.6b
in value generated



4,800+
high-value jobs
created



Automated equipment in a model factory environment at A*STAR SIMTech.

Impact Story

Aircraft Engine Hub

Rolls-Royce's advanced manufacturing activities in Singapore have drawn on A*STAR's R&D capabilities through a collaboration spanning more than two decades. The partnership has focused on applying AI, automation, robotics and digital technologies to advanced manufacturing.

The company's Trent engines power around half of the world's wide-body aircraft, such as the A380, A350, A330 and Boeing 787. At the heart of these engines are the wide chord fan blades — the large blades visible at the front of the engine, which deliver most of the engine's thrust when they spin. Each engine contains around 25 of these advanced titanium blades, whose tips travel faster than the speed of sound during take-off. Engineered to withstand immense aerodynamic forces while remaining lightweight, they represent one of the most sophisticated challenges in modern aerospace manufacturing.

An ultra-clean, high-temperature pressure vessel is required for the manufacturing of the titanium blades, and the shape of the finished blades must be extremely precise. Each blade's dimensions, including its shape, size and twist, must conform to an accuracy of 40 micrometres, or about half the width of a human hair.

“Singapore is an ideal base for advanced manufacturing, with strong infrastructure, skilled talent and a pro-innovation operating environment that supports long-term investment. By combining A*STAR's research capabilities with our engineering expertise, we are able to move from ideas to deployment faster.”

Neil Mantle
Director of Manufacturing Engineering and Materials
Rolls-Royce



Rolls-Royce aeroengines feature wide chord fan blades, a key component manufactured at the company's Seletar facility in Singapore.

Singapore hosts Rolls-Royce's lead global production site at the company's Seletar campus. This specialised manufacturing facility produces around 90% of all wide chord fan blades for the company's global fleet. Rolls-Royce employs around 700 people in Singapore.

A*STAR's collaboration with Rolls-Royce dates back to a jet engine modelling research project in 2002. The partnership expanded to include Singapore Aero Engine Services Private Limited (SAESL) in 2017, with the three partners launching the Smart Manufacturing Joint Lab (SMJL). The initiative applies advanced technologies in live production environments to modernise operations at Rolls-Royce's fan blade manufacturing facility.

By 2024, Rolls-Royce had achieved a 20% productivity improvement over 2017 levels, supported by technologies developed through the Joint Lab alongside its own operational initiatives. The partnership has also supported supplier development, with eight local SMEs added to the two companies' approved vendor lists after meeting rigorous quality and safety standards.

Through SMJL:

20%

**productivity improvement
achieved by Rolls-Royce**

8

**local SMEs were added to
Rolls-Royce and SAESL's
approved vendor lists**



Maintenance, Repair, and Overhaul

The research that underpins advances in high-end manufacturing is also key to the related market for aircraft Maintenance, Repair and Overhaul (MRO). The sector is becoming increasingly important thanks to an expanding and ageing global commercial airline fleet. Supply bottlenecks for new aircraft mean that planes stay in service for longer, driving additional MRO demand.

Estimates vary, but consultancy Oliver Wyman projects that the sector will grow from US\$119 billion in 2025 to US\$156 billion by 2035. Growth in Asia Pacific is expected to outpace the global average, with a projected compound annual growth rate (CAGR) of nearly 10%.

This presents a significant opportunity for Singapore, which already accounts for around 10% of global aerospace MRO output, including 20% of global engine MRO. As part of RIE2030, Singapore will invest further in MRO-relevant research. The aim is to create future advances that can be applied to the sector, driving further productivity increases and investment.

A*STAR's impact is perhaps the most visible in the MRO sector through its collaboration with SAESL via the SMJL. By applying advanced technologies such as AI, automation and digital manufacturing to real-world operations, the partnership is helping to transform the industry in Singapore.

SAESL announced a four-year investment strategy in 2024 worth S\$242 million to meet the growing demand for next-generation Rolls-Royce aeroengine services. The plan is expected to deliver a 40% expansion in MRO capacity by 2029, enabling the company to service over 400 engines annually.

SAESL announced a four-year investment strategy in 2024 worth

S\$242 million

Expected to deliver

40% expansion in MRO capacity by 2029 and 500 high-value jobs



Beyond creating around 500 new high-value jobs at SAESL, the expansion will generate positive spillover effects across Singapore's aerospace ecosystem, creating new opportunities for local SMEs to participate in and integrate with global aerospace supply chains.

A*STAR's aerospace partnerships are also helping companies improve maintenance and repair operations while creating new opportunities for local enterprises. In 2019, Singapore Airlines (SIA) and SIA Engineering Company (SIAEC) partnered with A*STAR to develop a process for refurbishing worn aircraft cabin components rather than replacing them. The resulting technology reduced refurbishment times from six months to three weeks, improved durability by 50%, and was validated through a pilot line that returned more than 2,000 refurbished parts to service.

The technology was subsequently licensed to local SME ATC Globe Holdings in 2023. Since then, ATC has **delivered more than 15,000 refurbished parts to SIA, generating an estimated S\$2.8 million in revenue** and securing its position as a vendor for Singapore's national carrier. Building on this success, A*STAR, SIA and SIAEC have expanded their collaboration through new Joint Laboratories focused on advanced aerospace manufacturing, maintenance automation and GenAI-enabled airline operations, deepening Singapore's capabilities across the aerospace value chain.



Scaling Singapore's Semiconductor Advantage

S\$30 billion

in new investments committed by global semiconductor companies into Singapore between 2022-2025

Semiconductors power almost every aspect of the modern economy — from smartphones and cloud computing to electric vehicles, artificial intelligence and advanced communications. Driven by rapid growth in AI, high-performance computing and electrification, the global semiconductor market is projected to reach US\$1.6 trillion by 2026, far higher than the early projection of US\$1 trillion by 2030.

Singapore accounts for around 10% of global chip output and 20% of semiconductor equipment units worldwide. Between 2022 and 2025, global semiconductor companies committed more than S\$30 billion in new investments into Singapore, reinforcing confidence in the country's manufacturing excellence, research capabilities and highly skilled workforce.

As conventional transistor scaling approaches its physical limits, future semiconductor innovation increasingly depends on new ways of integrating chips, moving data and improving system

performance. Technologies such as advanced packaging, heterogeneous integration and silicon photonics are becoming critical enablers.

Established 35 years ago, the A*STAR Institute of Microelectronics (A*STAR IME) has built deep expertise in semiconductor R&D and worked closely with industry to translate research into manufacturing. Over the years, A*STAR has continued to deepen and expand its semiconductor capabilities, which today span advanced packaging, silicon photonics, piezoelectric microelectromechanical systems (piezoMEMS), flat optics, radio frequency gallium nitride (RF GaN), power electronics, as well as radiofrequency and cryogenic integrated circuit design. This depth of capability accumulated over more than three decades, reflects Singapore's long-term investment in semiconductor R&D, and it continues to strengthen the country's competitiveness in a strategically vital industry.

Building Local Capabilities Through Industry Partnerships

A*STAR's research capabilities have helped leading semiconductor companies anchor their innovation activities in Singapore through long-term collaborations. **Companies including Applied Materials, GlobalFoundries, Soitec, STMicroelectronics and Toray Industries have established long-term collaborations with A*STAR IME, reinforcing Singapore's position as a trusted location for advanced semiconductor R&D and manufacturing.**

One of A*STAR's longest-standing partnerships is with Applied Materials, a global semiconductor equipment leader employing more than 4,000 people in Singapore. Through its decade-long collaboration with A*STAR IME, Applied Materials developed in Singapore a new portfolio of equipment for the global advanced packaging market. This collaboration led to the establishment of the Centre of Excellence in Advanced Packaging (CEAP) in 2012, which now employs 170 people, followed by a S\$286 million expansion in 2021.

The partnership also established a S\$150 million Joint Laboratory in 2015, focused on advanced materials for logic and memory chips. Its latest milestone is the Applied Process Equipment Accelerator (APEX), launched in 2024. The Joint Laboratory enables local SMEs to develop and qualify high-value components for advanced semiconductor equipment, helping them enter global supply chains and move up the value chain. Over the past decade, the partnership has anchored Applied Materials' advanced packaging R&D in Singapore and delivered tangible innovation and manufacturing outcomes. The company is investing S\$600 million to launch its new Tampines Campus, which is expected to create 1,000 additional jobs and strengthen its long-term manufacturing and R&D presence in Singapore.



>35 Industry projects and 4 Consortia



>160 Patents generated locally as of 2021



170 Employed in CEAP



>50% Products made for global markets



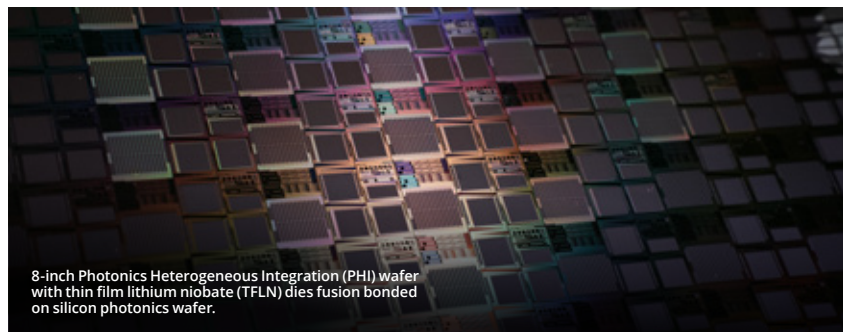
>10 Advanced products developed in Singapore since 2011



A*STAR researchers conducting a post-process inspection of a 200 mm silicon carbide (SiC) wafer in the pilot line.

Impact Stories

Globalising Singapore-Born Innovation



One notable example of the commercialisation of A*STAR's semiconductor research is Advanced Micro Foundry (AMF), a specialist silicon photonics foundry spun out from A*STAR IME in 2017. Built on technologies and capabilities developed at A*STAR, AMF became one of the world's largest pure-play silicon photonics foundries, serving leading global optical transceiver companies. By manufacturing in Singapore, the company plays an important role in the global photonics ecosystem, helping customers commercialise next-generation optical communications and sensing technologies.

From 89 employees at the time of its spin-off, AMF grew to 210 by 2025, building a global customer base, manufacturing capabilities and proprietary technology platforms from Singapore.

In 2025, GlobalFoundries acquired AMF while expanding its collaboration with A*STAR in advanced packaging and silicon photonics. The acquisition marked a significant milestone in the commercialisation of Singapore research, demonstrating how technologies developed through sustained public investment can evolve into globally competitive industrial capabilities.

Advancing the Next Generation of Semiconductor Innovation



Building on this momentum, A*STAR and GlobalFoundries have launched a strategic research partnership to accelerate silicon photonics R&D in Singapore. The collaboration combines A*STAR's research expertise with GlobalFoundries' advanced manufacturing capabilities to strengthen local innovation, develop talent and create new opportunities in high-value manufacturing.

Singapore is also strengthening its semiconductor ecosystem through the National Semiconductor Translation and Innovation Centres (NSTICs) hosted by A*STAR. NSTICs accelerate the translation of next-generation technologies into commercially deployable solutions. Bringing together researchers and capabilities from A*STAR and the local universities, NSTICs bridge research and industrial-scale production, helping companies shorten development timelines, and reduce the risks of bringing them to market. A*STAR plays a key role as Singapore's semiconductor innovation engine, and continues to contribute to Singapore's position at the forefront of the global semiconductor industry.



Translating Biomedical Discoveries

Since the launch of the Biomedical Sciences Initiative in 2000, Singapore has built biomedical sciences into a key pillar of Singapore's economy. As of 2024, the sector generated more than S\$32 billion in output and employed over 26,000 workers. Between 2022 and 2025, local biotechnology, MedTech and digital health companies closed over 250 deals and raised US\$2.56 billion.

During this period, A*STAR expanded capabilities in drug discovery, diagnostics, medical technology translation and venture creation to support the translation of research into clinical and commercial outcomes. Built over more than two decades, these capabilities have made biomedical sciences a high-value pillar of the economy, one that supports skilled jobs and turns scientific discovery into commercial and clinical impact.

Building Singapore's Therapeutics Pipeline

By RIE2025, the number of active local biotechnology companies in Singapore grew to around 70, with start-ups collectively raising US\$1.4 billion across 51 fundraising deals and an increasing number advancing into clinical development. During the tranche, A*STAR helped grow 38 biotechnology companies, comprising 14 new spin-offs and 24 companies supported through research partnerships and technology licensing.

The growth of Singapore's therapeutics ecosystem was reflected in the increasing number of locally originated assets progressing from scientific discovery into preclinical and clinical development.

This has attracted international industry interest. In June 2022, global pharmaceutical company Boehringer Ingelheim licensed global rights to antibody candidates developed from a tumour target identified through the Singapore Gastric Cancer Consortium (SGCC), with optimisation and translational

development led by A*STAR's Experimental Drug Development Centre (EDDC). Under this agreement, A*STAR could potentially receive payments totalling more than €100 million in upfront, success-based development and commercialisation milestone payments.

The ecosystem has also produced a new generation of venture-backed biotechnology companies advancing Singapore-originated innovation. For example, A*STAR spin-off Nuevovor, which is developing gene therapies for cardiomyopathies driven by aberrant mechanobiology, successfully raised US\$50 million in Series B financing in May 2025. The round was co-led by international life sciences investors Kurma Partners and Angelini Ventures, with participation from EDBI, ClavystBio, Boehringer Ingelheim Venture Fund, Highlight Capital and SEEDS Capital, reflecting growing confidence in Singapore's capacity to generate and scale therapeutics companies with international potential.



Enabling the Growth of a MedTech and Digital Health Ecosystem

Beyond therapeutics, the number of MedTech and digital health start-ups in Singapore increased to more than 400, which collectively raised US\$1.8 billion through 207 fundraising deals. These companies span diagnostics, medical devices, digital health and AI-enabled healthcare solutions.

During RIE2025, A*STAR supported close to 90 local SMEs, start-ups and spin-offs in the MedTech sector, including 11 MedTech spin-off companies. Through translational platforms such as DxHub and MedTech Catapult, A*STAR has also helped to progress technologies from research towards clinical and commercial application. A growing number of A*STAR-supported technologies are now reaching healthcare providers and patients worldwide.

Examples include Mirxes' GastroClear blood test for early-stage gastric cancer detection, which is available at over 200 clinics and hospitals in Singapore; Us2.ai's AI-powered echocardiography software, which supports cardiovascular disease diagnostics and has secured regulatory clearances across more than 28 markets worldwide; and Respiree's remote cardiopulmonary monitoring platform, an A*STAR spin-off whose FDA-cleared technology has attracted US\$13.1 million in Series A funding and supported international expansion.

**Close to 90 MedTech
SMEs, start-ups and spin-offs
supported by A*STAR**



Diagnostic assay development and laboratory testing at A*STAR's DxHub.

Strengthening Local Enterprises

While Singapore has continued to attract global investments in high-tech industries, innovation intensity remains uneven across the broader economy. Many local enterprises still face challenges in building in-house R&D capabilities, accessing specialised talent and adopting technology.

Although Singapore's overall R&D has increased, local enterprise R&D spending remains relatively modest, growing by about 20% from S\$1.4 billion in 2018 to S\$1.7 billion in 2023. This underscores the importance of helping more local enterprises and SMEs build the capabilities needed to innovate, compete and grow.

Across RIE2025, A*STAR awarded about 149 licenses to SMEs and start-ups. More than 130 SMEs and start-ups tapped on A*STAR's T-Up programme. 20 local companies also qualified as suppliers to Multinational Corporations (MNCs) and Large Local Enterprises (LLEs), indicating that local enterprises are becoming more competitive, more trusted and better able to access higher-value market opportunities. In total, A*STAR supported more than 300 unique SMEs and start-ups².

The T-Up programme is where local companies tap on A*STAR's scientific talent to build in-house R&D capabilities, develop new products and processes, and translate technical know-how into business growth. This demonstrates how strengthening firms' innovation capabilities can translate into stronger business performance, better jobs and greater resilience. By enabling local enterprises to build capabilities and move up the value chain, A*STAR is helping Singapore grow new sources of high-value activity and strengthen the competitiveness of its wider economy.



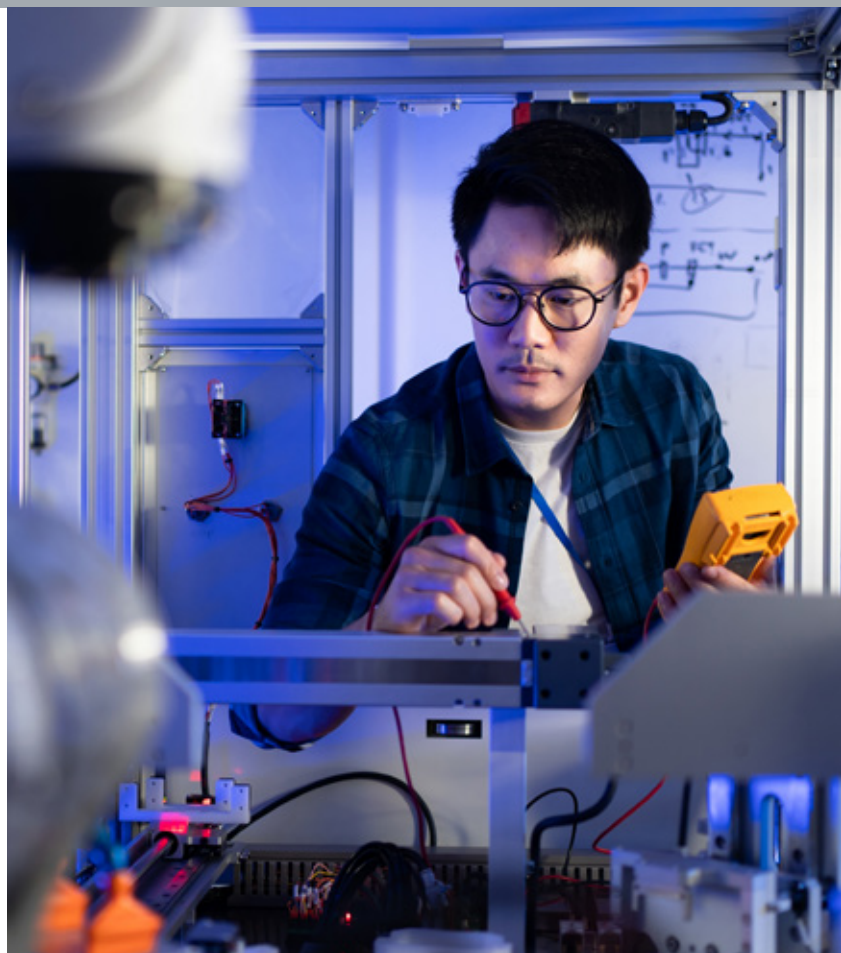
Over 300 SMEs and start-ups supported in RIE2025



Compared with similar non-participating firms, companies supported through T-Up recorded:

65% higher R&D spending
44% higher revenue
22% higher employment

²The figure of 20 companies reflects the full RIE2025 data collation. Figures in earlier publications, including A*STAR's Annual Report, were based on data available at the time of compilation.



Impact Stories**Mencast Marine**

A Sea Change in Manufacturing



A large marine propeller undergoing inspection at Mencast's manufacturing facility.
Source: Mencast.

For more than four decades, Mencast Marine has manufactured propellers for tugboats, fast boats and other working vessels. Traditionally, these were produced through sand casting, a process intensive in labour, materials and energy. Today, Mencast has advanced from carbon to silicon, moving beyond traditional manufacturing into an era where technology, data, intelligent automation and industrial know-how come together to solve important customer problems and create measurable economic and strategic value.

Working with A*STAR and the National Additive Manufacturing Innovation Cluster (NAMIC), Mencast has transformed how its propellers are designed and produced. Physics-based modelling and AI help engineers evaluate designs more rapidly and better match each propeller to the vessel, engine and operating requirements.

Manufacturing has also been transformed through additive manufacturing, or 3D printing. Guided by a precise digital blueprint, robotic arms build propellers layer by layer in bronze alloy. The technology has reduced manpower requirements by approximately 20% to 30%, while the manufacturing carbon footprint of a 200kg propeller is about 30% lower. This shift from physical resources to intelligent assets is enabling the next generation of sustainable industrial solutions for Singapore and the world.

Abrasive Engineering

Smart Manufacturing Solutions for Stronger, Safer Surfaces



Abrasive Engineering team with A*STAR ARTC scientists.

Advanced manufacturing for high-tech sectors like aerospace often requires surface enhancement. That might involve abrasive blasting with angular particles of grit to roughen the surface for painting, coating or bonding. Alternatively, shot peening involves firing rounded particles at the surface to compress and strengthen it. Manual techniques for creating such surface finishes are labour-intensive and expose workers to harsh environments.

To overcome these issues, A*STAR partnered advanced manufacturing company Abrasive Engineering to create a Joint Lab. The initiative has focused on developing advanced surface enhancement technologies, automation systems and digital process controls to improve productivity, precision and workplace safety. The collaboration translated A*STAR's advanced manufacturing research into commercially deployable technologies. Between 2020 and 2023, the Joint Lab developed six new product lines, including an automated abrasive blasting system which combines robotics, computational algorithms and intelligent process control to deliver more consistent surface finishing. These innovations helped Abrasive Engineering to diversify beyond traditional blasting services into advanced surface enhancement products serving aerospace, marine, offshore, energy, additive manufacturing and medical industries. The company more than doubled its revenue to S\$12 million, while the first Joint Lab generated S\$3.5 million increase in revenue, contributing 28% of the company's total revenue during the project period.

Impact Stories**KoolLogix**

More Sustainable Cooling for AI Infrastructure



The KoolLogix Heat Removal Solution, jointly developed by KoolLogix and A*STAR, is helping improve cooling efficiency in data centres, including those operated by OCBC.

The rapid growth of artificial intelligence, cloud services and high-performance computing is driving increased energy demand from data centres. In Singapore's tropical climate, cooling systems can account for up to 40% of a data centre's electricity consumption, creating a pressing need for more energy-efficient cooling technologies.

To address this challenge, A*STAR has worked closely with KoolLogix, building on a longstanding collaboration that dates back to the company's spin-off in 2018 from ERS Industries, a manufacturer of high-end computing equipment. During RIE2025, A*STAR researchers applied advanced computational and digital technologies, including computational fluid dynamics, AI, predictive maintenance, Internet of Things technologies and Model Predictive Control — to enhance and optimise KoolLogix's proprietary Heat Removal Module. Digital twins were also developed to evaluate system performance under different operating conditions and support further technology development.

In December 2024, the partners launched an S\$8 million Joint Lab to co-develop next-generation, higher-density heat-removal technologies for increasingly demanding data-centre applications. The collaboration has strengthened KoolLogix's commercial growth and technology capabilities. The company achieved threefold revenue growth in 2022, expanded into regional markets including Indonesia, and secured customers such as OCBC Bank.

Zincode Technologies

Teaching AI to Spot Critical Aerospace Defects



An AI-powered automated optical inspection solution that combines specialised lighting and high-resolution imaging to identify defects quickly and accurately.

As aerospace manufacturers adopt increasingly automated and digitally enabled production processes, quality inspection has become a critical bottleneck. Detecting microscopic surface defects on complex components such as jet engine fan blades is vital to the plane's overall efficiency. Particularly at the leading edge of the blade, an increase of a few microns can make an appreciable difference to aerodynamics. Traditional methods to spot defects relied on skilled inspectors performing manual visual assessments, but that makes consistency, traceability and productivity difficult to scale.

Multiple A*STAR research institutes partnered Zincode, a company specialising in AI deep learning machine vision, to develop a solution based on automated optical inspection. It uses specialised lighting, high-resolution cameras and AI-powered defect detection algorithms to spot problems.

In RIE2025, A*STAR's collaboration enabled Zincode to move to delivering AI-enabled industrial inspection systems for global aerospace manufacturers. Following participation in the Smart Manufacturing Joint Lab (see page 9), Zincode became an approved Rolls-Royce vendor, secured new opportunities with other aerospace companies and achieved a 30% increase in sales. Building on its strengthened AI inspection capabilities, the company subsequently expanded its footprint by deploying AI deep learning solutions into the packaging and medical device industries.

Impact Stories**Hyphens Pharma**

From Lab to Solution: Improving Care for Chronic Skin Conditions



Skin conditions such as atopic dermatitis, which affect up to 20% of children and 10% of adults, typically require long-term management. While conventional moisturisers provide symptomatic relief, there is demand for science-based formulations that actively restore the skin barrier. A*STAR has a long-standing partnership with local SME Hyphens Pharma, which began in 2014 with the aim of translating dermatological research into successful commercial products. In recent years, A*STAR scientists contributed to the development of the company's Ceradan Advanced Hand Balm. They formulated the product, conducted stability testing, supported production scale-up, and developed the technology transfer and manufacturing protocols required for commercial production.

The collaboration also extended beyond formulation science. The product underwent clinical evaluation with the help of A*STAR, the Skin Research Institute of Singapore (SRIS) and clinical partners. They used Raman spectroscopy — a technique that identifies skin ingredients via their unique molecular fingerprint under laser light — to profile water content and ceramide-related signatures. Hyphens launched Ceradan Advanced Hand Balm in September 2024, the first and only hand balm with active pH control technology designed for hand eczema. The product is currently available in Singapore, demonstrating successful translation from A*STAR-supported research to commercialisation. It has also enabled Hyphens to expand into regional and international markets.

WaferLead

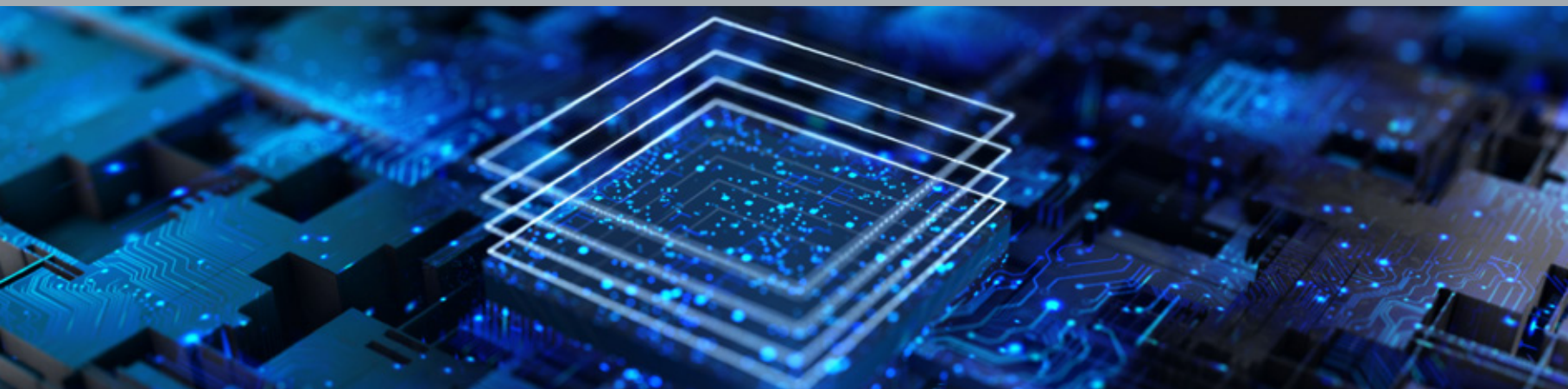
Fast-Tracking Innovation in Semiconductor Manufacturing



Ms Xie Ling (left), seconded from A*STAR IME under the T-Up programme, with WaferLead's crystal growth team. Source: WaferLead.

Electric vehicles, renewable energy systems and high-power electronics require semiconductors that operate more efficiently under high voltages and temperatures. Silicon carbide (SiC) offers significant performance advantages over conventional silicon, but manufacturing high-quality wafers remains a key technical bottleneck that limits production yield and increases costs.

In RIE2025, WaferLead partnered A*STAR to strengthen its SiC wafer manufacturing capabilities and overcome these technical limitations. Through A*STAR's T-Up programme, the company was able to draw on specialist semiconductor manufacturing expertise to develop proprietary SiC wafer growth processes and improve temperature control and particle management. The collaboration accelerated WaferLead's technology development and commercial readiness. Process optimisation that would typically require around one year was completed in approximately three months. The increased downstream device yields to over 80%, allowing WaferLead's products to command a 20% to 30% price premium over comparable alternatives. In 2025, WaferLead's annual revenue grew to S\$900,000 from S\$480,000 in 2024. The company also secured S\$16 million in new projects and over US\$50 million in investment commitments to support future production facilities. Beyond commercial growth, SiC technology can reduce power losses in devices by up to 80% and offers three times the thermal conductivity of conventional silicon, supporting more energy-efficient EVs and power electronics.



Growing Deep Tech Ventures

Deep technologies are often built on scientific breakthroughs that are too novel or specialised for immediate adoption by existing companies. Dedicated ventures are therefore frequently needed to develop products, secure investment and bring these innovations to market. While this creates opportunities for new industries and businesses to emerge, it also means deep tech ventures typically face longer development timelines, higher capital requirements and more complex pathways to scale.

Over RIE2025, A*STAR spun off more than 70 new companies, which collectively employ more than 900 people. These ventures span areas including biomedical sciences, advanced manufacturing, semiconductors and scientific instrumentation, translating research capabilities into products, services and businesses that contribute to Singapore's innovation economy.

Investment has followed. A*STAR start-ups raised more than S\$1.2 billion in follow-on funding during RIE2025, more than three times the S\$390 million raised during RIE2020. The growing

maturity of A*STAR's venture portfolio is also reflected in 9 exits through initial public offerings (IPOs) and mergers and acquisitions in RIE2025. These developments reflect the increasing value of Singapore-developed deep technologies, while helping to anchor intellectual property, entrepreneurial talent and high-value activities in Singapore.

This progress has taken place against an increasingly challenging global environment for venture-backed companies. As venture funding conditions become more selective globally, the ability to demonstrate clear commercial opportunities and credible routes to scale has become increasingly important.

However, experience during RIE2025 also showed that promising companies need greater access to experienced entrepreneurial talent, venture-building expertise and investors prepared to support longer commercialisation timelines.



To address these, A*STAR has introduced programmes such as the Entrepreneur Partner Programme (EPP) and Venture Atelier Programme to connect researchers with entrepreneurs, investors and industry experts who can assess commercial potential, build teams and develop viable business propositions around promising technologies.

A*STAR is also strengthening its venture-building partnerships with international and Singapore-based investors and venture builders, including Xora Innovation, ClavystBio, Flagship Pioneering and MPM BioImpact. Beyond patient capital, these partners bring valuable capabilities including specialist networks and deep insights into market needs and opportunities.

Lessons from RIE2025 also highlight where A*STAR's translation model must continue to evolve. For some medium-term research efforts, the potential industry value was not always clearly defined at the outset, and promising assets did not always have sufficiently strong pathways to adoption. In RIE2030, A*STAR will work more closely with agencies and industry partners to frame sharper problem statements, identify credible use cases, and more purposefully manage the path from research to deployment.



A*STAR spun off >70 new companies



Which raised more than S\$1.2b in follow-on funding during RIE2025, >3x the S\$390m raised during RIE2020



And collectively employ >900 people



Impact Story

Lucence

Bringing Cancer Diagnostics from Bench to Bedside

Focus Area and Opportunity

For many cancer patients, tissue biopsies can be invasive, difficult to repeat, or not feasible at all, potentially delaying treatment decisions. There is growing demand for minimally invasive diagnostics that enable earlier detection, precision treatment and disease monitoring across multiple cancer types.

What the Company Does

Lucence develops liquid biopsy tests that detect cancer signals from tumour DNA and tumour RNA circulating in a patient's blood.

A*STAR's Involvement

Lucence was founded as an A*STAR spin-off, with intellectual property originating from A*STAR research assigned to the company. It has since expanded its portfolio of precision oncology diagnostics while continuing R&D collaborations with A*STAR Growth Trajectory.

Growth Trajectory

- Raised US\$9.2m in 2017 and US\$20m in 2019.
- First Asia-based healthcare service provider to secure US Medicare coverage for next-generation sequencing (NGS) liquid biopsy testing.

Impact

Lucence's cancer diagnostics support doctors in making informed treatment decisions. LiquidHALLMARK® can identify treatment-relevant biomarkers from a blood sample, including when tumour tissue is insufficient for genetic testing. In 2025, Lucence partnered with Mayo Clinic Laboratories to expand access to the test in the US.



Respiree's 1Bio™ platform on mobile and PC, and the RS001 wearable sensor. Source: Respiree.

Impact Story

Respiree

Predictive Healthcare a Reality with AI-Assisted Monitoring

Focus Area and Opportunity

Patient's respiratory rate can be an early indicator of deterioration in their condition, yet in hospitals worldwide it is still largely measured manually. As healthcare systems increasingly shift towards predictive and home-based care, there is a need for continuous monitoring that enables clinicians to detect deterioration earlier and intervene proactively.

What the Company Does

Respiree is developing and commercialising wearable sensing technologies for predictive cardio-respiratory care.

A*STAR's Involvement

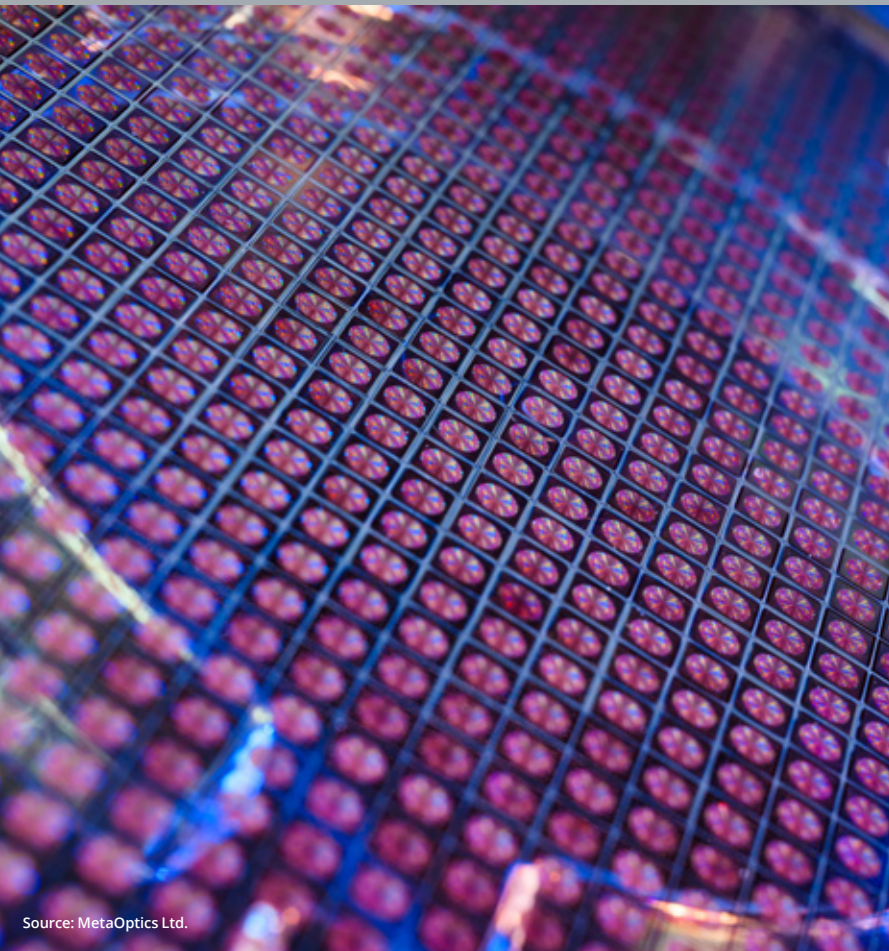
The company licensed the core intellectual property from A*STAR — a wearable biophotonics platform capable of continuously monitoring respiratory and cardiac signals. The platform's clinical potential was already clear from early validation studies.

Growth Trajectory

- Secured two US FDA 510(k) clearances for cardio-respiratory monitoring.
- Obtained CE marking and regulatory approvals in Australia and Singapore.
- Integrated Philips' open patient monitoring ecosystem, feeding Respiree data into clinical workflows.
- Recognised with the 2024 President's Technology Award and TIME's World's Top HealthTech Companies 2026.

Impact

Respiree's wearable technology enables patients' vital signs to be monitored continuously and remotely, helping healthcare teams identify signs of deterioration earlier while reducing the need for manual checks. In a study done with a local hospital, the technology demonstrated the potential to save up to 12 hours of nurses' time each day in a general ward, freeing them to focus on other clinical duties.

**Impact Story****MetaOptics**

Building the Future of Ultra-Thin Optics

Focus Area and Opportunity

Conventional glass lenses are reaching their physical limits as electronic devices become smaller and more sophisticated. Ultra-thin metalenses — flat surfaces that focus light using a surface patterned with nanostructures — offer significant advantages in miniaturisation, optical performance and energy efficiency.

What the Company Does

MetaOptics is developing new techniques to design and manufacture metalenses at scale.

A*STAR's Involvement

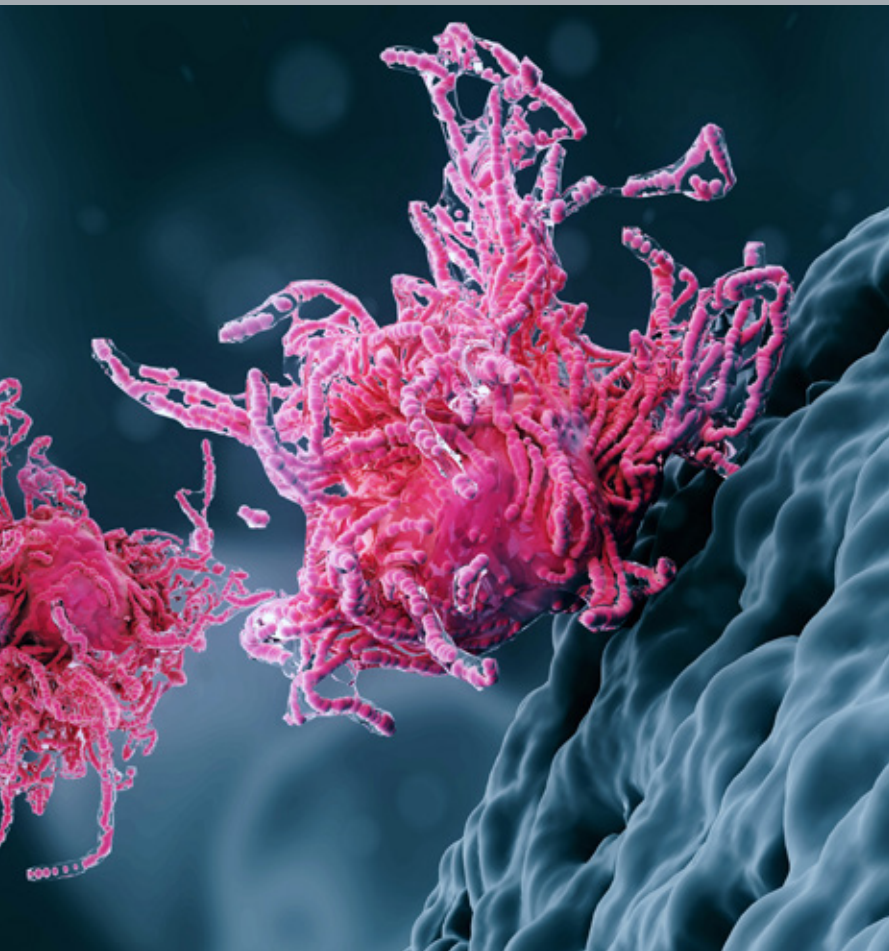
In 2023, MetaOptics and A*STAR co-developed a Direct Laser Writer for high-precision, rapid prototyping of metalenses, substantially shortening the design-to-prototype cycle. The team also achieved a world-first demonstration of directly processing metasurfaces on 300mm glass wafers, paving the way for scalable semiconductor-style manufacturing of metalenses.

Growth Trajectory

- Established a leading-edge integrated metalens platform spanning design, rapid prototyping, wafer fabrication, testing and product integration.
- Listed on SGX Catalist in 2025, becoming the first pure-play metalens company to be publicly listed.

Impact

MetaOptics has taken ultra-thin metalenses from research towards commercial use, supplying the technology to customers for applications including pico projectors and optical scanners. Its ability to manufacture metalenses on 300mm glass wafers has also demonstrated a pathway to producing the technology at scale using semiconductor manufacturing processes.

**Impact Story****Lion TCR**

Engineering the Immune System to Fight Liver Cancer

Focus Area and Opportunity

Chronic hepatitis B affects more than 290 million people worldwide and is a major driver of liver cancer, particularly in Asia. Current antiviral treatments suppress the virus but rarely cure infection, leaving many patients requiring long-term therapy.

What the Company Does

Lion TCR is developing T-cell receptor-engineered T-cell therapies for HBV-related liver cancer and chronic hepatitis B.

A*STAR's Involvement

Lion TCR licenses its core HBV-specific TCR technology from A*STAR. Using mRNA, it enables a patient's own T cells to transiently express receptors that recognise HBV antigens presented by tumour cells, allowing the T cells to target them. A*STAR also supported Lion TCR through T-Up talent to strengthen its research and manufacturing capabilities.

Growth Trajectory

- Raised US\$40m Series B2 (2023), following a US\$20m Series A (2018), to support clinical development and manufacturing capabilities in China.
- Gained US FDA Fast Track and Orphan Drug designations for LioCyx-M004 in HBV-related liver cancer, now cleared for international Phase 2 trials.
- Became the first TCR-T therapy to enter clinical development for chronic hepatitis B (2025).

Impact

Lion TCR's therapy has shown early evidence that its engineered immune cells can fight advanced hepatitis B-related liver cancer. In an early-stage clinical trial, one patient experienced tumour reduction lasting more than two years, providing early evidence of the therapy's potential for patients with limited treatment options.

**Impact Story****Nuevovor**

Next-Generation Gene Therapies for Genetic Heart Disease

Focus Area and Opportunity

Cardiomyopathies are a group of diseases that affect the heart muscle, weakening its structure and reducing its ability to pump blood effectively. Left untreated, patients frequently suffer heart failure or dangerous arrhythmias.

What the Company Does

Nuevovor is developing genetic medicines for cardiomyopathies.

A*STAR's Involvement

The company builds on the agency's scientific capabilities in mechanobiology, nuclear envelope biology and cardiac disease modelling. Its proprietary Protein Organ-Specific Interactome Analysis, or ProSIA, platform maps aberrant force transmission in heart cells, enabling Nuevovor to identify disease mechanisms and design genetic medicines that target shared disease pathways.

Growth Trajectory

- US\$24m Series A raised in 2021.
- US\$50m Series B raised in 2025, supporting plans for a first-in-human Phase 1/2 clinical trial of NVC-001 with first patient dosed in October 2026.
- Progressed from preclinical research to clinical development, with operations across Singapore, the US and Europe.

Impact

Nuevovor has translated research into a potential new treatment for LMNA-related dilated cardiomyopathy, a severe inherited heart disease with limited treatment options. Its approach aims to address the underlying disease mechanism rather than only managing its effects, and has progressed from laboratory research to testing in patients.

A scientist wearing a white lab coat, blue hairnet, and safety glasses is working in a laboratory. They are using a pipette to transfer liquid into small vials. The background is a blurred laboratory setting with various equipment.

Building Capabilities for National Resilience

Translating quality research is key to tackling national priorities such as healthcare and sustainability



Building Capabilities for National Resilience

When crises or complex challenges arise, Singapore's ability to respond effectively depends on expertise, platforms and infrastructure that it has already built. A*STAR invests early in key scientific breakthroughs, even before their potential is fully apparent.

The agency helps turn long-term research investments into capabilities and solutions that Singapore can mobilise when it matters. Many of these outcomes were delivered through a whole-of-system effort involving public agencies, healthcare institutions, universities and industry partners.

A*STAR invests early in
**promising science often
before its full potential
is clear**

Improving Human Health

Biomedical research benefits patients by developing or enabling access to new treatments that are more effective, more targeted and associated with fewer adverse side effects. For populations, it can allow better prevention, earlier detection and intervention and ultimately, healthier lives. A high level of scientific readiness can strengthen Singapore's resilience and ability to respond to future health threats.

A*STAR has contributed to the development of research expertise and its healthcare applications in several ways, as illustrated by the following examples and box stories.

One notable example is A*STAR's contribution to Singapore's National Precision Medicine (NPM) programme. Since the establishment of the Genome Institute of Singapore in 2000, A*STAR has developed expertise in Asian population genomics, large-scale sequencing and genomic data analysis. When NPM commenced its first phase in 2017, A*STAR Genome Institute of Singapore (A*STAR GIS) and partners helped establish a reference dataset of more than 10,000 Singaporean genomes. This partnership has continued into subsequent phases, with A*STAR contributing to the generation, analysis and curation of national genomic datasets.

Today, NPM has generated more than 110,000 whole genome sequences, creating one of the largest multi-ancestry Asian population cohort dataset. A*STAR continues to contribute expertise in genomic data infrastructure and analytics, supporting research and healthcare applications. Beyond Singapore, the A*STAR-PRECISE Genomic Innovation Team is leading an international effort to develop common standards for assessing the quality of genomic data through the Global Alliance for Genomics and Health (GA4GH). Approved as an official GA4GH product in 2025, these standards will make it easier for research labs worldwide to share and compare genomic information, supporting research into the genetic causes of diseases and the development of more personalised healthcare.

Separately, the national translational platforms established by A*STAR, such as A*STAR's Diagnostics Development Hub (DxD Hub) and EDDC, help researchers, clinicians and industry partners move promising discoveries more efficiently and expeditiously towards deployment.

Since 2014, DxD Hub has supported the co-development and deployment of over 24 diagnostic products and services. These include AI-enabled tools that help clinicians identify patients requiring urgent care more quickly, precision diagnostics that guide cancer treatment decisions, and tests that support earlier detection and more personalised care. **Together, these innovations have reached more than 18 million patients across more than 45 countries,** demonstrating how discoveries made in Singapore can deliver healthcare impact globally.

One example is UNITED™ 600. Co-developed by Lucence, National Cancer Centre Singapore (NCCS), Singapore General Hospital (SGH) and DxD Hub, it is a comprehensive multi-cancer tissue test that analyses hundreds of cancer-related genes to help oncologists identify potentially actionable biomarkers to inform targeted treatment decisions. DxD Hub supported its progression towards a clinically deployable product through assay development, validation and productisation. Having supported thousands of patients across Singapore and the region since its launch in 2021, the partnership has now progressed to UNITED 2.0, an AI-enabled platform that combines whole-exome and whole-transcriptome sequencing. It is working with patient advocacy groups to ensure future diagnostics better reflect patients' needs and experiences.



Impact Story

Built Before the Pandemic: The Value of Long-Term Science Investment

Imagine flying into a mountainous region in a thunderstorm with the windows blacked out and no radar. That is something akin to the situation facing public health authorities in the early stages of the COVID-19 pandemic. The virus was moving rapidly through populations around the world, but they had very little visibility on the different viral variants, where they were spreading and how quickly.

Six years earlier, in 2014, Singapore had joined an international effort that is now called the GISAID Global Data Science Initiative. It was initially focused on influenza, but was later expanded to include other pathogens, including SARS CoV-2. GISAID serves as a global repository for pathogen sequence information contributed by countries around the world, providing visibility into which variants are circulating and where they are spreading.

A*STAR researchers took on a crucial role: improving and maintaining the analytical engine behind the database. During the COVID-19 pandemic, this enabled researchers to better understand the implications of mutations in the virus's RNA sequence. The GISAID database was invaluable for the global pandemic surveillance effort. The interpretive tools that underpinned its utility were substantially built and run out of Singapore.

The foundations for Singapore's response to COVID-19 were laid after SARS in 2003. The country committed to build a critical mass of scientists, engineers and clinician-scientists

with the depth to respond to future infectious disease threats. That decision, followed by years of investments in key scientific capabilities, meant that A*STAR researchers could move more quickly to support the national and global pandemic response to COVID-19.

Another example of those capabilities in action was the agency's rapid work on diagnostics. In February 2020, just two weeks after the first COVID-19 patient was detected in Singapore, A*STAR and Tan Tock Seng Hospital (TTSH) had developed Fortitude, a frontline virus detection test that identifies COVID-19 genetic material quickly and accurately.

Soon after, supplies of key reagents for the PCR-based test became severely constrained. By July, DSO National Laboratories, A*STAR and DxD Hub had co-developed a new diagnostic test, RESOLUTE 2.0, a direct PCR test that eliminated the need for a separate RNA extraction step, thereby sidestepping crucial supply chain bottlenecks. Deployed at locations such as Changi Airport, it also provided an alternative testing approach at a critical point of entry, helping Singapore maintain reliable diagnostic operations amid disruptions to global supply chains.

Later, A*STAR set up the Stronghold Diagnostics Lab with partners. That enabled high-throughput national COVID-19 testing which supported Singapore's ability to detect infections quickly and manage public health risk.

A*STAR's modelling capabilities helped policymakers to assess risks and trade-offs before public health measures were implemented, supporting safer reopening and more targeted public health interventions. Careful immunological studies increased understanding of the immune response to vaccination in Singapore's population and helped inform national vaccination policies.

A*STAR's existing scientific capabilities and infrastructure, built on sustained investments over past decades, allowed it to move quickly on surveillance, diagnostics and vaccination. This supported an effective public health response and contributed to Singapore achieving one of the lowest case fatality rates (the proportion of patients who died after contracting the infection) for the disease in the world.



Members of the A*STAR, DxD Hub and TTSH team behind the development of the Fortitude™ test kit.

Impact Story

The Study Growing Up With Singapore's Children – And Making Them Healthier

A child's health is shaped by many factors: what they eat, their sleep routine, their genes, where they live, their mother's experiences during pregnancy. To reliably disentangle these factors requires detailed studies that are large enough to rule out chance correlations and long enough to spot links between early experiences and consequences years later.

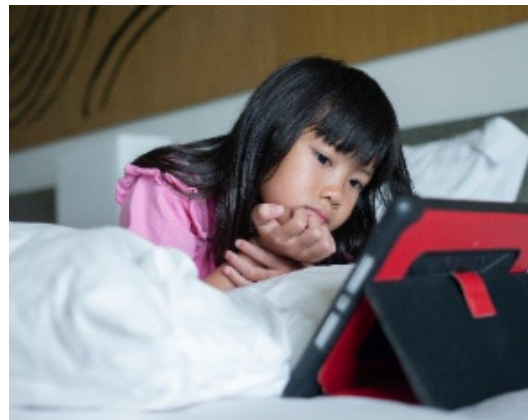
The Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study, run by researchers from A*STAR, the National University of Singapore (NUS), National University Health System (NUHS) and KK Women's and Children's Hospital (KKH), aims to do just that. Since 2009, it has followed more than 1,000 pregnant mothers through birth and beyond. Now in its second decade, the study continues to follow its participants as they enter adolescence. The study has already produced over [400 scientific publications](#) in fields as diverse as neurodevelopment, nutrition and social science. It has attracted over S\$32 million in industry funding from major nutrition companies including Abbott, Nestlé and Danone.

Among the many areas studied through GUSTO, one has been childhood screen use, a topic of growing concern for parents navigating the digital age. [Research findings](#) showed that excessive screen time during infancy was associated with differences in brain function and poorer self-regulation, with cognitive effects still visible beyond age eight. [Studies using GUSTO data](#) also found that high screen use in babies

under two years was linked to slower decision-making and increased anxiety later in life. These negative effects were not fixed, however. Social and physical interactions such as reading together, playing face-to-face games or engaging in music and sports were found to help mitigate the impact of early screen exposure.

This body of evidence has informed national guidance on appropriate screen time for children and was incorporated into the Grow Well SG initiative, a national health promotion strategy launched in 2025 that is designed to instil healthy lifestyle habits in children and adolescents.

That has also been the case for many of the other research themes advanced by GUSTO. For example, research from the cohort data has led to national screening for gestational diabetes (2018), prompted clinical guidelines on perinatal mental health screening (2023), and informed dietary guidelines for young children (2024).



The GUSTO study has:



Produced **over 400**
scientific publications



Attracted **S\$32 million**
in industry funding

Enabling Environmentally Sustainable Growth

Singapore's transition to a low-carbon economy requires evidence to guide decisions on new fuels, energy technologies and industrial solutions. Many decarbonisation pathways involve trade-offs in safety, performance and cost that must be understood before implementation at scale.

Through capabilities in modelling, simulation and engineering, A*STAR helps agencies and companies evaluate options and reduce uncertainty. This enables more informed decisions on the adoption of low-carbon technologies across the economy.

A*STAR's work spans both the adoption of near-term low-carbon solutions and the development of technologies that could support future energy systems. To inform safe ammonia storage and handling, A*STAR researchers have used physics-based simulations to assess how ammonia disperses and behaves under different conditions.

The modelling shows that the required safety buffer around a storage facility can be significantly reduced from 37 km to 3.1 km while maintaining safeguards for workers, nearby communities and infrastructure.

A*STAR is also developing technologies for emerging energy industries. In 2023, A*STAR developed a tungsten coating technology for plasma-facing components — the materials that line the interior walls of nuclear fusion reactors and must withstand extreme heat.

This technology was selected by Commonwealth Fusion Systems (CFS), a leading nuclear fusion company spun out of Massachusetts Institute of Technology (MIT), for use in its SPARC reactor, a major global pilot project aimed at demonstrating commercially viable fusion energy.



Impact Story

Building Singapore's Translational Platform For Industrial Decarbonisation

For hard-to-abate sectors such as energy, chemicals and manufacturing, promising low-carbon technologies must be proven at industrial scale before companies can adopt them. Singapore therefore needs shared capabilities that allow emerging solutions to be tested, adapted and scaled while reducing the cost and risk of commercial deployment.

Between 2021 and 2025, A*STAR shifted from advancing individual decarbonisation programmes to creating the translational infrastructure and capabilities needed to support a portfolio of low-carbon technologies. This included repositioning the Institute of Chemical and Engineering Sciences as the Institute of Sustainability for Chemicals, Energy and Environment (ISCE²), bringing together expertise in catalysis, process engineering, sustainable materials and digitalisation to address complex sustainability challenges.



The pilot-scale sustainable aviation fuel test rig project between A*STAR and IHI Corporation. Source: JTC.

Working with EDB, JTC and industry, A*STAR pioneered a modular “plug-and-play” approach for evaluating carbon capture and utilisation technologies. Building on this concept, A*STAR announced the S\$62 million Low-Carbon Technology Translational Testbed (LCT³) in 2025, which will provide shared pilot-scale infrastructure for validating carbon utilisation, hydrogen and other emerging low-carbon technologies before commercial deployment.

These platforms are complemented by industry collaborations such as a pilot-scale project with IHI Corporation to produce sustainable aviation fuel from carbon dioxide and hydrogen, as well as studies that support the safe adoption of ammonia as an alternative fuel for shipping.

Together, these efforts have established a national translational ecosystem that strengthens Singapore's ability to test, adapt and scale successive generations of low-carbon technologies.



Source: JTC.

Deploying AI for Impact and Trust



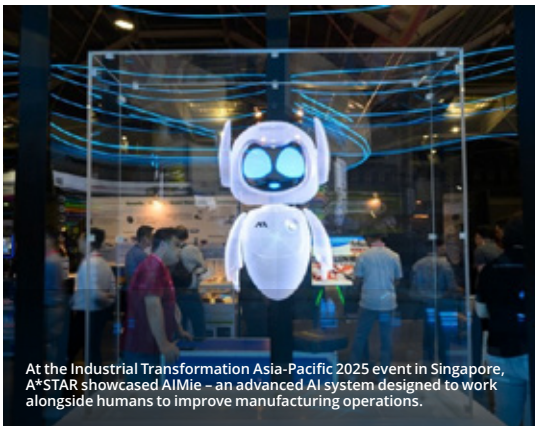
As Singapore faces increasingly complex economic and societal challenges, data and AI are becoming important tools for decision-making, innovation and productivity. For a small and highly connected economy, these capabilities can help organisations make better use of limited resources, respond more quickly to changing conditions and tackle problems that would be difficult to address through conventional approaches.

Over RIE2025, A*STAR has advanced and deployed AI across industry and public agencies, while building strategic national capabilities that strengthen Singapore's long-term competitiveness. From optimising manufacturing operations to transforming healthcare and accelerating scientific discovery, A*STAR is helping to translate advances in AI into tangible real-world impact.

Manufacturing

In manufacturing, AI is strengthening companies' competitiveness by improving quality, optimising operations and addressing manpower constraints.

Through the AI Centre of Excellence for Manufacturing (AIMfg), A*STAR is working with more than 30 companies to deploy AI solutions in use cases such as predictive maintenance, automation and quality assurance. Projects with partners such as Rockwell Automation and Sunningdale are helping manufacturers deploy AI solutions that deliver tangible productivity gains.



At the Industrial Transformation Asia-Pacific 2025 event in Singapore, A*STAR showcased AIMie – an advanced AI system designed to work alongside humans to improve manufacturing operations.

Connectivity

AI is enabling smarter management of Singapore's increasingly complex public and operational systems. Developed by A*STAR in partnership with the Land Transport Authority (LTA), ST Engineering and other stakeholders, the Cooperative and Unified Smart Traffic System (CRUISE) dynamically adapts traffic signals to changing traffic conditions. Trials achieved reductions in peak travel times by 9% to 18%, while live trials at seven intersections concluded in May 2025 as the system progressed towards a minimum viable product.

A*STAR is also helping to address complex engineering challenges in Singapore's maritime sector. Marine propeller design has traditionally relied on scarce overseas expertise and lengthy trial-and-error processes, constraining local design capabilities and innovation.

To address this, A*STAR co-developed OPTIMISEProp with industry partner Mencast - an end-to-end, AI-driven optimisation platform integrating multi-fidelity simulation, machine learning and high-performance computing. The platform has reduced propeller design cycles from weeks to less than a day, while enabling rapid exploration and optimisation of design alternatives. Its performance has been validated through model testing and sea trials across multiple vessels, demonstrating how AI and advanced computational engineering can strengthen Singapore's indigenous maritime engineering capabilities and accelerate the development of higher-performance, energy-efficient marine propellers.

Healthcare

AI is improving healthcare through earlier detection and diagnoses, better risk prediction and faster clinical decision-making. Together with healthcare partners, A*STAR has developed AI-powered tools to support more precise disease management. The Tumour Immune Microenvironment Spatial (TIMES) score, developed with Singapore General Hospital (SGH), analyses tumour tissue to predict liver cancer risk recurrence after surgery, helping clinicians identify high-risk patients who may require closer monitoring and personalised treatment. Fragle, an AI-enabled blood test, supports faster, more affordable cancer monitoring, helping clinicians detect treatment resistance or relapse earlier, with less reliance on invasive biopsies.

AI also streamlines complex clinical workflows to help specialists focus their attention where it is most needed. Developed with the Singapore National Eye Centre (SNEC), with support from SingHealth and A*STAR, the Singapore Enhanced Eye-Care Referral System (SEERS) uses AI to triage routine eye referrals, reducing unnecessary specialist visits and helping halve waiting times. In cardiovascular medicine, the AI-driven national Platform for CT cOronary angiography for clinical and industrial applications (APOLLO), developed with the National Heart Centre Singapore, National University Hospital, and Tan Tock Seng Hospital, automates quantitative CT coronary angiography analysis.

By integrating advanced assessments not routinely performed in clinical practice, APOLLO reduces analysis time from several hours to approximately 10 minutes, improving efficiency and enabling more comprehensive, reproducible cardiovascular assessment.

Digital Services

Alongside applying AI to specific sectors, A*STAR is also developing AI capabilities suited to Singapore and the region. A key example is MERaLiON, A*STAR's multilingual and multimodal AI model tailored to how people communicate in Singapore and Southeast Asia, including local accents, multiple languages and dialects, as well as code-switching and cues such as emotion and intent.

MERaLiON has achieved significant community adoption, with more than 743,000 model downloads and 462,000 dataset downloads. Through its API services, A*STAR has supported local ecosystem development by issuing more than 280 API keys to SMEs, start-ups, research institutions and multinational corporations to build innovative applications leveraging MERaLiON capabilities. To accelerate industry adoption, A*STAR established the MERaLiON Consortium in May 2025, bringing together public- and private-sector partners to explore real-world applications including multilingual customer service, healthcare and financial services. The consortium has grown to 18 members, including ST Engineering, NCS, Grab, Microsoft, Lion Befrienders, DBS, OCBC, and Standard Chartered Bank.

Early outcomes have demonstrated strong industry interest and adoption. In public safety applications, ST Engineering has used MERaLiON for the transcription and analysis of multilingual audio in decision support systems for mission-critical operations. NCS has deployed MERaLiON within NCSGPT for use across its Singapore workforce. Through collaboration with industry partners, A*STAR has demonstrated lightweight versions of MERaLiON running directly on devices with Apple silicon such as Mac and iPad, without internet connectivity, enabling privacy-preserving AI applications.



Minister for Digital Development and Information Josephine Teo with representatives from the MERaLiON consortium at ATxSummit 2025, highlighting the growing ecosystem supporting Southeast Asia-focused AI innovation. Source: Infocomm Media Development Authority (IMDA).

Accelerating Scientific Discovery

A*STAR is applying AI to shorten discovery cycles, uncover new insights and accelerate innovation across multiple scientific domains.

Examples include RiNALMo, A*STAR's RNA language model for therapeutic design, as well as collaborations with CusPAI to speed up the discovery of advanced materials for carbon capture. These efforts demonstrate how AI is helping researchers shorten development cycles and explore new scientific frontiers.

Impact Story

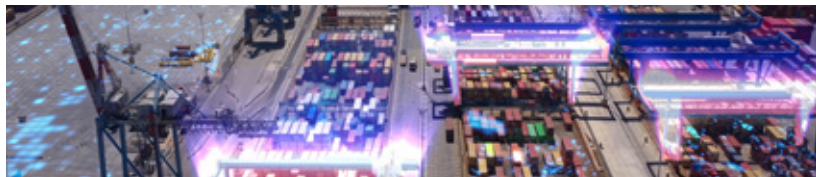
Science for a Safer, Smarter Port

R&D is supporting the evolution of Singapore's port as it adapts to new fuels, changing safety requirements and greater automation.

Under the Maritime Transformation Programme, A*STAR researchers worked with the Maritime and Port Authority of Singapore (MPA), the Singapore Maritime Institute (SMI) and research partners to model how ammonia and methanol could disperse during potential leaks. A predictive planning tool developed through the programme was integrated into MPA's Maritime Digital Twin and used during a chemical spill exercise in July 2025, supporting situational awareness and decisions on mitigation measures. The research also supports MPA's development of operational standards and safety protocols for alternative-fuel bunkering.

The same push towards safer, more data-driven operations extends across the port. With PSA Marine, A*STAR developed AI tools that detected substantially more near-miss incidents than manual reporting alone, giving harbour pilots a fuller picture of navigational risks.

As port automation scales up, A*STAR and PSA Singapore have also explored decentralised ways of coordinating large fleets of automated guided vehicles. The research could support more scalable and resilient autonomous operations at Tuas Port, which will have an annual handling capacity of 65 million Twenty-foot Equivalent Units (TEUs) when completed in the 2040s.



Impact Story

Enabling Safe and Trusted AI Adoption

Generative AI has dramatically lowered the barriers to creating convincing deepfakes and misinformation, making it harder for people and organisations to assess what information can be trusted. To strengthen Singapore's resilience against these emerging risks, the A*STAR-hosted Centre for Advanced Technologies in Online Safety (CATOS) was established in 2024, bringing together expertise in AI, media forensics and digital trust.

CATOS is developing technologies to detect manipulated and AI-generated content, as well as to enhance transparency and attribution of digital content to support authenticity verification. These include PROVO, a content provenance tool being trialled with media organisations to provide information about the origin and modification history of digital content, and SLEUTH, a deepfake detection platform being used by public agencies and media organisations.

Beyond technology development, CATOS has collaborated with the National Library Board through its S.U.R.E. initiative and IMDA through its Digital for Life Festival to improve digital and AI literacy through community outreach programmes. These efforts help build public awareness and strengthen the ability to assess digital content critically, contributing to trust in Singapore's digital information environment.



A close-up, artistic photograph of a microscope's objective lens positioned just above a silicon microchip. The chip's intricate circuitry is visible, with a grid of square dies in the center. The lighting is dramatic, with a strong blue tint and a bright light source from the upper right creating a lens flare and highlighting the metallic surfaces of the microscope. The background is blurred, emphasizing the precision of the scientific instrument.

Advancing Frontier Technologies with Excellent Science

Advancing discovery-led research that lays the
foundation for Singapore's long-term value creation

Advancing Frontier Technologies with Excellent Science

Breakthroughs that shape economies and societies often begin years before their applications become apparent. For Singapore, investing in frontier science is therefore about developing the talent and research expertise that can create value for Singapore in the long-term.

A*STAR [ranked 25th globally among government research institutions](#) in the Nature Index Global Ranking. A*STAR's Field-Weighted Citation Impact (FWCI) increased from 1.80 in 2016-2020 to 1.91 in 2021-2025, indicating that its publications were cited 91% above the global average for comparable research. Over RIE2025, 26.6% of A*STAR's publications ranked among the world's top 10% most cited papers.

The examples that follow illustrate how long-term investments in scientific capability are advancing understanding and creating new possibilities in areas ranging from AI and advanced manufacturing to future communications, sustainability and human health.



Over RIE2025, **26.6%**
of **A*STAR** publications ranked
among the **world's top 10%**



Advanced Manufacturing

Greener Steel Manufacture Through Machine Learning

Conventional metal additive manufacturing — often referred to as 3D printing — frequently relies on energy-intensive post-heat treatments to achieve the required material strength. This increases energy consumption, production time and carbon emissions.

To avoid this extra step, A*STAR researchers developed a form of ultra-high-strength steel designed using machine learning that is specifically optimised for laser additive manufacturing. The process is a new form of in-situ 4D printing, where material strengthening occurs simultaneously with component fabrication, thereby avoiding the need for a post-heat treatment step.

The customised material achieved a tensile strength of 1.54 GPa, a measure of how much stress the material can take before failing. It outperforms many conventionally processed high-strength steels. By eliminating energy-intensive post-processing while maintaining exceptional mechanical performance, this research advances more sustainable metal manufacturing by reducing energy use and carbon emissions. It promises to contribute to more efficient production of high-performance components for aerospace, automotive and other advanced industries.

[Advanced Science Vol 10 Issue 10, Feb 2023.](#)



Artificial Intelligence

Using AI to Predict Liver Cancer Recurrence

Liver cancer has one of the highest recurrence rates after surgery, making early risk prediction critical to improving patient outcomes. To address this, A*STAR and its partners developed the Tumour Immune Microenvironment Spatial (TIMES) score, an AI-powered tool that predicts the likelihood of liver cancer recurrence.

Unlike conventional methods that rely on tumour stage or individual biomarkers, TIMES analyses both the tumour and the surrounding immune cells, examining how they are organised and interact within the tumour microenvironment. These spatial patterns provide deeper insights into a patient's risk of relapse.

In validation studies, TIMES predicted recurrence with more than 80% accuracy, supporting earlier identification of high-risk patients. By helping clinicians identify such patients earlier, the tool supports more tailored post-surgical monitoring and treatment decisions, which contributes to better long-term outcomes for liver cancer patients.

[Nature, Mar 2025.](#)



Biomaterials

Tuning “Oiliness” to Build Safer, Faster Antibacterial Polymers

Antimicrobial resistance is a significant and growing threat to global health and development. In 2019, antibiotic resistance was directly responsible for 1.27 million deaths worldwide. By 2030, the World Bank estimates that it will create between US\$1 trillion and US\$3.4 trillion in GDP losses per year. To reduce its impact, scientists have been looking for new ways to fight bacteria that microbes cannot easily outsmart. A*STAR researchers, working with Nanyang Technological University and IBM, designed a series of biodegradable, antibacterial polymers that kill bacteria in a way that mimics the body's own infection-fighting molecules.

They tested five versions of the polymer, each with a slightly different “oily” side chain, to see how this affected the polymer's ability to kill bacteria while sparing healthy human cells. They found that greasier polymers killed bacteria faster, but if they became too oily, they became less selective and started damaging red blood cells too. The most hydrophobic version worked mainly by punching holes in bacterial membranes. These findings help pinpoint the right balance of “oiliness” needed to design future antimicrobial materials that are both fast-acting and safe, informing the search for effective alternatives to conventional antibiotics.

[Advanced Healthcare Materials, Vol 11 Issue 7, May 2021.](#)

**Genomics & Transcriptomics**

Sharpening RNA Sequencing for Better Disease Insights

Advances in precision medicine depend on accurate understanding of how genes are expressed in health and disease. However, differences between RNA sequencing technologies have made it difficult for researchers to compare results and select the most appropriate methods for studying disease.

To address this, A*STAR researchers developed the SG-NEx dataset, one of the most comprehensive benchmarks for evaluating RNA sequencing technologies. The team compared five sequencing methods across 14 human cell lines, assessing their ability to detect gene transcripts, fusion genes and RNA modifications. The benchmark provides researchers with a reliable reference for comparing sequencing performance across a range of biological applications.

The research strengthens the foundations of genomics by enabling the development of more accurate bioinformatics tools and improving confidence in RNA sequencing analyses. These advances could accelerate disease research, support more precise diagnostics and enable the development of targeted therapies.

[Nature Methods, Mar 2025.](#)



Immunology

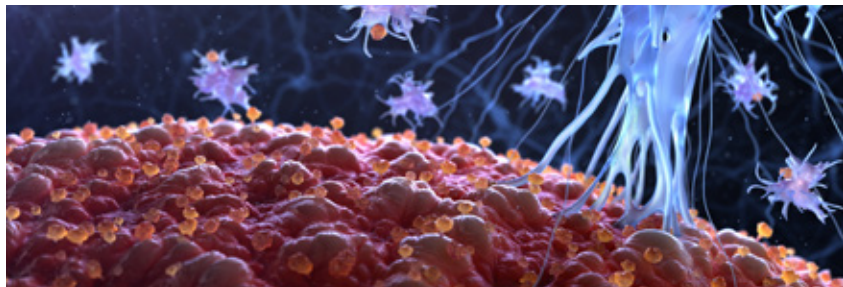
Understanding How Tumours Subvert the Immune System

Many cancers evade the body's immune system by turning its natural defences into allies that support tumour growth. Understanding how this happens could unlock new approaches to cancer treatment and improve outcomes for patients.

To address this, A*STAR researchers investigated the role of neutrophils — immune cells that normally help fight infection — within the tumour microenvironment. The team discovered that once neutrophils enter tumours, they can be reprogrammed into a previously unrecognised state known as T3 neutrophils. These actively promote tumour survival instead of attacking cancer cells. This finding provides new insights into how tumours manipulate the immune system to their advantage.

The research deepens understanding of the complex interactions between cancer and the immune system, and identifies T3 neutrophils as a promising therapeutic target. By modulating these tumour-supporting immune cells, future therapies could suppress tumour growth, strengthen anti-cancer immune responses and improve the effectiveness of immunotherapies.

[Science, Jan 2024.](#)



Low Carbon Technologies

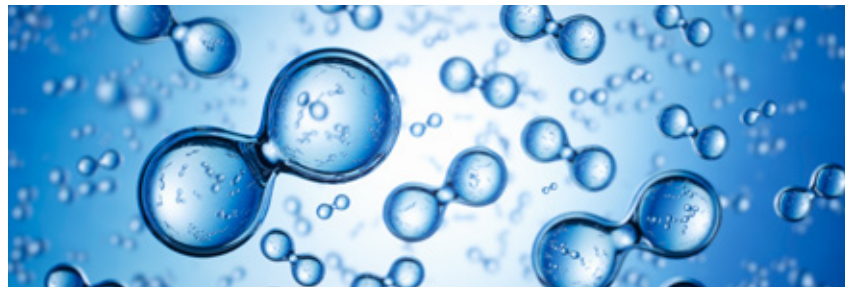
Optimising Catalyst Performance in Hydrogen Production

Hydrogen produced through electrochemical splitting of water using renewable energy is expected to play a key role in the transition to a low-carbon economy. However, improving the efficiency and durability of the catalysts that drive this process remains a major challenge.

To address this, A*STAR researchers developed a new approach that enhances oxygen evolution reactions by harnessing a light-triggered electron transfer mechanism. The study revealed the pivotal role of reversible changes to the molecular shape of the nickel oxide catalyst, enabling the reaction to overcome conventional limitations and improving catalyst performance.

The research provides new insights into the fundamental processes that govern electrocatalysis. These findings could support the development of more robust and efficient oxygen evolution catalysts for electrochemical water splitting, accelerating the production of low-carbon hydrogen. That would advance clean energy technologies that are critical to industrial decarbonisation.

[Nature, Oct 2022.](#)



Smart Materials and Microsystems

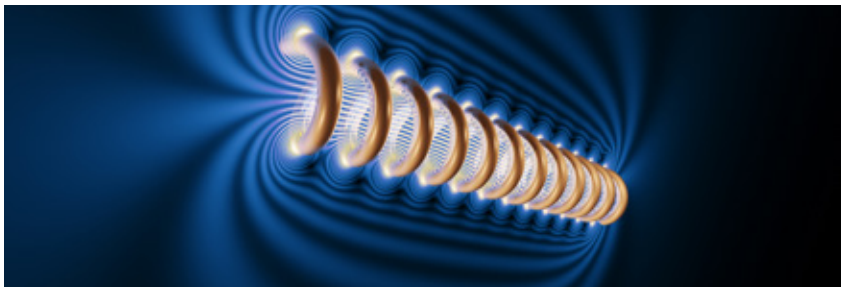
Advancing Sustainable Computing with Skyrmionic Devices

As demand for faster and more energy-efficient computing grows, conventional magnetic memory devices are approaching their physical limits. Tiny, swirling knots in a material's magnetisation — called magnetic skyrmions — have been proposed as alternative information carriers. But the practical application of these nanoscale magnetic whirlpools has been hindered by the lack of a device capable of reliably reading and electrically controlling individual skyrmions.

To address this challenge, A*STAR researchers developed the world's first wafer-scale all-electrical skyrmionic magnetic tunnel junction capable of electrically writing, reading and deleting individual skyrmions. The device achieved readout signals of up to 70% and enabled deterministic switching using 1,000th of the energy of existing approaches, while supporting three stable, non-volatile memory states.

This device provides a practical foundation for all-electrical skyrmionic computing architectures. It paves the way for next-generation memory and computing technologies that are faster, more energy-efficient and capable of supporting emerging AI and advanced computing applications.

[Nature, Mar 2024.](#)



Semiconductors and Connectivity

Data Transmission Fast Enough for the AI Age

AI is driving huge demand to cloud data centres. Training and serving large models require moving staggering amounts of data between GPUs, racks, and switches. Traditional copper wiring cannot provide the speed and volume necessary and is being replaced with optical interconnects that rely on light to transmit data.

The photodetector is often the bottleneck in the receiver. Demonstrating one that is simultaneously fast and sensitive, while producing low dark current (a form of background noise) and buildable at scale is an important goal to make the next generation of interconnects practical and affordable.

A*STAR researchers have developed a photodetector that includes crystals of germanium within etched recesses on a silicon wafer. The team showed that the novel lateral P-i-N design geometry of the internal structure gives significant performance advantages — escaping the usual speed-vs-sensitivity trade-off.

[IEEE Xplore, May 2026.](#)



Population Health

Mapping Asia's Immune Diversity to Advance Precision Medicine

Around a decade ago, scientists began efforts to create an atlas of every cell type in the body. That involves categorising different cell types in multiple individuals based on the genes those cells are expressing.

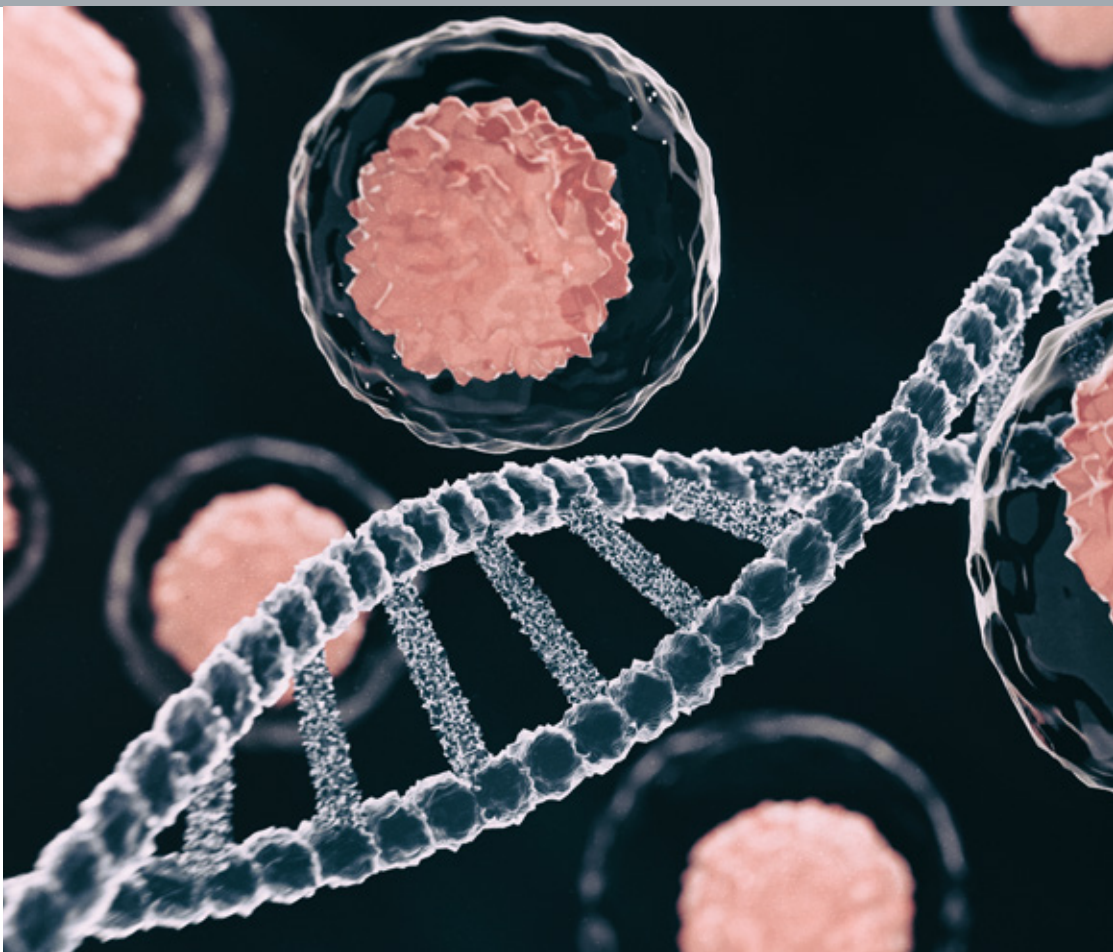
Understanding the cells that make up the immune system is particularly important for conditions such as inflammation, cancer and infectious disease because the data from healthy cells can provide a reference for comparison.

To date, immune cell reference mapping projects have relied mostly on samples from European populations. That limits their ability to accurately capture the genetic and biological diversity of Asian populations, hampering their clinical usefulness.

A*STAR researchers and their collaborators have developed the Asian Immune Diversity Atlas (AIDA), the first multinational single-cell reference atlas of immune cells from Asia. The atlas is built from more than 1.2 million immune cells from 619 healthy donors across seven population groups in five Asian countries. It revealed how ancestry, ethnicity, age and sex influence immune cell composition and gene expression.

By providing a comprehensive reference for Asian immune diversity, AIDA lays the foundation for more accurate diagnostics, population-specific therapies and precision medicine, while enabling biomedical research that better reflects the diversity of Asian communities.

[Cell, Apr 2025.](#)





Nurturing Top Talent for Real-World Impact

Nurturing world-class talent builds the teams and ventures
that turn research into real-world impact



Talent as the Most Critical Driver of Impact

Through sustained long-term investment, Singapore has developed a broad base of high-calibre scientific talent and research expertise. This has been critical in advancing scientific discovery and its translation to benefit industry sectors, create new enterprises and contribute to national strategic priorities.

A*STAR's scholarship and fellowship programmes have contributed significantly to this talent stream. As of 31 March 2026, A*STAR has built a pipeline of close to 2,000 researchers through a suite of scholarships with many remaining in Singapore and contributing to national RIE efforts. A number have progressed into scientific leadership roles, including CEOs, CTOs, principal investigators and professors, applying their expertise across industry, academia, government and the broader research ecosystem.

As Singapore enters its next phase of growth, talent requirements are becoming increasingly specialised. Strategic domains such as semiconductors, artificial intelligence, quantum technologies and biotechnology are expected to play a larger role in shaping future economic competitiveness and national capabilities, while global competition for expertise in these areas continues to intensify. Maintaining Singapore's position will require continued investment in talent development, alongside efforts to strengthen the links between research, innovation and industry. Recognising these shifts, A*STAR has continued to refine its talent development approach. In 2025, dedicated Semiconductor and Quantum tracks were introduced under the A*STAR Graduate Scholarship (AGS) to strengthen capabilities in areas critical to Singapore's future competitiveness.

At the same time, A*STAR strengthened its international research attachment model to include the Singapore Research Attachment Programme (SRAP), which supports strategic centre-to-centre collaborations between Singapore and leading overseas research institutions. Such attachments deepen international research partnerships and connect global research talent with Singapore's RIE ecosystem. These developments also marked a transition from programmes such as the Singapore International Graduate Award (SINGA) and Singapore International Pre-Graduate Award (SIPGA). These helped build Singapore's research talent base and international research linkages during an earlier phase of ecosystem development. As Singapore's research ecosystem matured, greater emphasis was placed on attachment- and partnership-based models that provide more targeted access to expertise, capabilities and collaborations in areas of strategic importance.

Turning Research Talent into Venture Builders



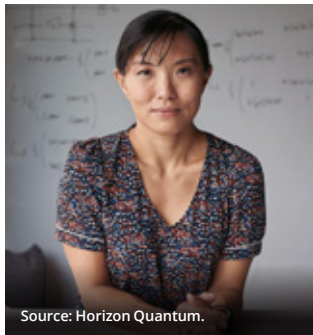
During National Service, **Dr Shawn Hoon** spent his weekends visiting laboratories at A*STAR Institute of Molecular and Cell Biology (A*STAR IMCB). It was his exposure to cutting-edge research that sparked a fascination with the genetic code and its parallels with computer programming. After joining A*STAR IMCB as a junior research fellow, the young electrical engineer taught himself computational biology and began exploring how engineering and biological sciences could be brought together to solve complex problems. Supported by an A*STAR scholarship, Dr Hoon pursued a PhD in genetics at Stanford University, deepening his expertise at the intersection of computation and biology.

A defining influence on Dr Hoon's career was the late Dr Sydney Brenner. Dr Hoon had first worked with the Nobel laureate on the landmark Fugu Genome Project at A*STAR. In 2008, Dr Hoon partnered with Dr Brenner to establish A*STAR's Molecular Engineering Laboratory (MEL), helping to nurture a generation of scientists and innovators — many of whom went on to contribute across Singapore's biotechnology ecosystem in start-ups, multinational companies, academia and the public sector.

Drawing on this experience in interdisciplinary research and talent development, Dr Hoon went on to co-found Proteona, which was acquired in 2022 by Singleron Biotechnologies. He then joined Automera, which is developing next-generation drug discovery platforms that combine artificial intelligence, quantum chemistry and targeted protein degradation to develop new therapies, initially targeting cancer and neurodegeneration.

Champion of Interdisciplinary Research for Drug Discovery

Dr Shawn Hoon
Chief Scientific
Officer, Automera



Source: Horizon Quantum.

Advancing Singapore's Quantum Future

Dr Tan Si Hui
Chief Science Officer,
Horizon Quantum

Dr Tan Si Hui is part of a pioneering generation of Singapore scientists translating frontier research into globally competitive deep tech ventures. Awarded the A*STAR National Science Scholarship, Dr Tan pursued physics at the California Institute of Technology (Caltech), followed by the Massachusetts Institute of Technology (MIT), where she conducted pioneering research in quantum illumination under quantum computing pioneer Professor Seth Lloyd.

Returning to Singapore, Dr Tan contributed to the nation's growing quantum research capabilities through roles at A*STAR, the Singapore University of Technology and Design (SUTD) and the Centre for Quantum Technologies (CQT). Her work spanned quantum optics, quantum communications and quantum cryptography, including novel protocols for secure delegated quantum cloud computing.

Dr Tan now leads Horizon Quantum's research and development efforts to make quantum computing more accessible and practical for real-world use. The company is building software infrastructure that empowers developers to use quantum computing to solve the world's toughest computational problems. In 2022, it became the first start-up to host a node on Singapore's National Quantum-Safe Network (NQSNN) and it was listed on the Nasdaq in 2026. Dr Tan's contributions to technology and innovation have been recognised nationally through her inclusion in the SG100 Women in Tech list (2021) and as a recipient of the SG Digital Leaders Award (2025).

Turning Research Talent into Venture Builders



For **Dr Natasha Ng**, scientific discovery is only the first piece in a jigsaw puzzle. Her ambition has always been to work within human disease research and be part of translating research into technologies that improve lives.

Formerly a scientist at A*STAR IMCB, Dr Ng spent her career investigating the genetic and molecular mechanisms underlying different diabetes subtypes. She has used stem cell technologies and different human cell models to study and develop next-generation therapies for one of the world's fastest-growing chronic disease.

Supported by an A*STAR scholarship, Dr Ng's entrepreneurial journey began while pursuing her doctorate at the University of Oxford, where she co-founded BioMe Oxford, a medical technology company developing a minimally invasive device to sample the human gut microbiome. The experience sparked her interest in bringing scientific innovations beyond the laboratory and into addressing real-world needs.

Building on her research at A*STAR, Dr Ng co-founded BetaLife in 2020 to translate A*STAR-developed stem cell research into regenerative therapies for diabetes and other intractable diseases. In 2025, she was appointed Chief Scientific Officer and Acting Chief Executive Officer, leading the company's efforts to advance its regenerative medicine platform towards clinical translation.

From Stem Cell Scientist to Entrepreneur Advancing Regenerative Medicine

Dr Natasha Ng
Chief Scientific Officer
and Acting Chief Executive
Officer, BetaLife



Developing the Next Generation of Research Leaders

Many scholars have gone on to lead research groups, institutes and academic programmes in fields of strategic importance to Singapore. Their stories illustrate how investments in talent help build research capabilities, institutions and future generations of scientific leaders.



Dr Wan Yue has spent her career uncovering one of biology's most complex languages: how the two and three-dimensional structures of RNA shape the way genes function and diseases develop. Today, as Executive Director of A*STAR Genome Institute of Singapore (A*STAR GIS), she is helping position Singapore at the forefront of genomics and RNA medicine.

Dr Wan pursued her PhD in Cancer Biology at Stanford University, where she pioneered one of the first high-throughput methods for mapping RNA structures across entire genomes. This helped to advance the emerging field of RNA structuromics, enabling scientists to better understand how RNA folding influences gene regulation, health and disease.

Subsequently leading her own lab, she has studied how RNA folds and functions at single cell and single molecule level. Her work has elucidated how RNA viruses such as Dengue and SARS-CoV-2 fold and interact with other host RNAs to replicate, as well as how RNAs function in mammalian systems through structure. Her team developed numerous methods, including the sm-PORE-cupine in 2026, a technique that analyses individual full-length RNA molecules to reveal how structural differences influence gene regulation, with potential applications in next-generation RNA medicines.

Dr Wan's scientific leadership has earned sustained international recognition. She was the first Singaporean to receive the prestigious Branco Weiss Fellowship, one of the world's most competitive programmes supporting exceptional early-career researchers. She was subsequently recognised as an EMBO Young Investigator, CIFAR-Azrieli Global Scholar, EMBO Associate Member and HUGO Chen Award of Excellence for her contributions to RNA biology.

Advancing Singapore's RNA Medicine Frontier

Dr Wan Yue
Executive Director,
A*STAR Genome
Institute of Singapore



From National Science Scholar to one of Singapore's leading researchers in artificial intelligence, wireless communications and next-generation networks, **Professor Tony Quek's** career has spanned research, talent development and research leadership. Supported by the A*STAR National Science Scholarship, he completed his doctoral studies at MIT before returning to Singapore and joining A*STAR Institute for Infocomm Research (I²R) as it was then called.

Professor Quek currently serves as Associate Provost (AI & Digital Innovation) and Cheng Tsang Man Chair Professor at SUTD. He leads efforts to strengthen AI capabilities across the university while advancing research in network intelligence, AI-native communications, non-terrestrial networks and 6G technologies. He also directs Singapore's Future Communications R&D Programme, a national initiative focused on developing next-generation communications capabilities.

Through leadership roles in academia, national research programmes and international standard-setting efforts, Professor Quek has contributed to the development of capabilities such as 6G and AI-RAN, which underpin Singapore's digital economy and future communications infrastructure. He is also co-founder of deeptech ventures including Silence Laboratories and NeuroRAN, which are translating advanced research in privacy-preserving AI, cryptography and AI-native network technologies into commercial applications.

Internationally recognised for his contributions, Professor Quek is an IEEE Fellow, Fellow of the Academy of Engineering Singapore and recipient of numerous global research honours.

Building Singapore's Future AI and Communications Capabilities

Professor Tony Quek
Associate Provost (AI &
Digital Innovation) and Cheng
Tsang Man Chair Professor,
Singapore University of
Technology and Design (SUTD)

Recognising Excellence

Singapore's research ecosystem also relies on the continued advancement of scientific knowledge and innovation capabilities. The following individuals were recognised through national honours such as the President's Science and Technology Awards and Young Scientist Awards during RIE2025.

President's Science and Technology Awards



Source: University of Auckland.

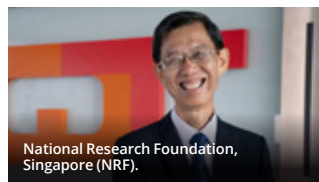
2021 Professor Sir Peter Gluckman – PSTM

"For his outstanding leadership in advancing health, clinical and biomedical sciences research, particularly the strengthening of developmental and early life research and enhancing Singapore's human health and potential R&D capabilities."



2022 Professor Hong Wangjin – PSTM

"For his outstanding contributions in building up the biomedical sciences research ecosystem in Singapore, particularly through strengthening public sector, academic and clinical research partnerships, nurturing scientific talent, and promoting innovation to support Singapore's economic development."



National Research Foundation, Singapore (NRF).

2023 Adjunct Professor Quek Gim Pew – PSTM

"For his outstanding contributions to shaping Singapore's Research, Innovation and Enterprise ecosystem, advancing national capabilities in defence, quantum, space and digital technologies, fostering research partnerships, and nurturing the next generation of STEM talent."



2024 Professor Richard Parker – PSTM

"For his outstanding contributions in stimulating the establishment of corporate R&D capabilities in Singapore, leadership in bringing companies and research institutions together for the benefit of Singapore and for promoting international collaboration in research and technology."



2025 Professor Lisa Ng – PSA

"For her pioneering contributions to viral infection immunology and advancing global pandemic management through groundbreaking research on arboviruses, in particular, chikungunya."



2024 Professor Malini Olivo, Dr Bi Renzhe, Dr Gurpreet Singh – PTA

"For their innovative integration of biophotonics, machine learning and clinical data to create Respiree, a healthcare solution which has demonstrated the potential to transform cardio-respiratory disease management in real-world settings."



2025 Professor Ng Geok Ing – PTA

"For his groundbreaking work in advancing Singapore's capabilities in radio-frequency Gallium Nitride (GaN) – an advanced III-V compound semiconductor technology – particularly in defence and commercial applications, by enabling local manufacturing capabilities and nurturing talent in this strategic field."

Recognising Excellence

Young Scientist Awards



2021 Dr Sarah Luo

"For her research in the neural circuit underpinnings of appetite regulation."



2022 Dr Bi Renzhe

"For his work in developing and translating novel bio-optical technologies and medical technology innovations."



2024 Dr Jonathan Göke

"For his pioneering work in developing computational methods for long-read RNA sequencing data that have enabled the profiling of RNA transcription and modifications at unprecedented resolution and accuracy."

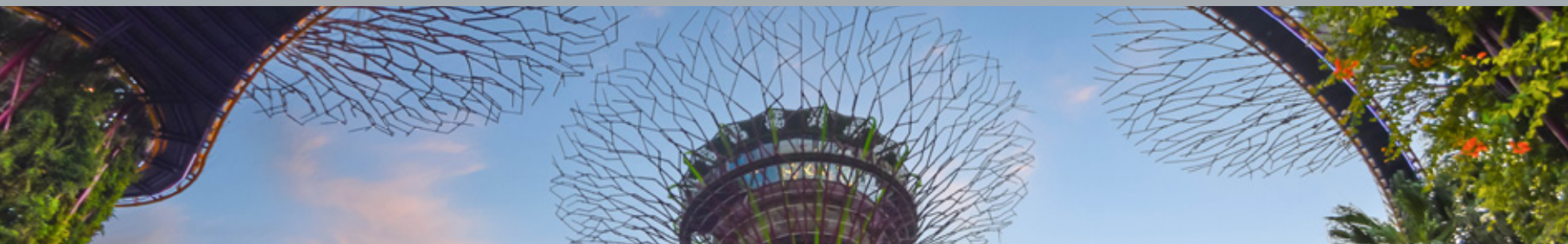


2025 Dr Chan Yi Hao

"For his groundbreaking discoveries on the brain's defence against viral infections, opening new possibilities for diagnosing and treating viral encephalitis."

Looking Ahead: A*STAR's Role in RIE2030





Looking Ahead: A*STAR's Role in RIE2030

As a small nation with limited natural resources, science, technology and innovation are central to Singapore's competitiveness and resilience. Rapid technological change, sharper global competition and more complex national challenges raise the stakes. RIE2030 is therefore focused on realising even greater value from research while continuing to keep our basic research capabilities and talent at the cutting edge.

In RIE2030, A*STAR will continue to advance three areas of emphasis: beyond technology push to real-world pull; beyond small scale efforts to multidisciplinary teams built around hard problems; and towards an AI-ready organisation that can work faster and with greater impact. The first shift is to further strengthen the pull from real-world needs. A*STAR will work earlier and more closely with industry and government to define the problems and opportunities that matter, translate

research into products, services and solutions that address these problems, and help companies innovate and deep tech ventures grow. Stronger translational capabilities and platforms will move promising ideas more quickly from the laboratory into testing, adoption and use.

To tackle complex problems, the second shift entails organising A*STAR's effort differently, moving beyond institutional or disciplinary boundaries. This is because high value problems in areas such as health, sustainability and advanced manufacturing cannot be solved by any one field or research institute. A*STAR will bring its best minds across disciplines together with industry, government and research partners to build teams with the range and depth of expertise to achieve breakthroughs no one could deliver alone.

The third area of emphasis is to become AI-ready across the organisation. A*STAR will embed AI in how research is conducted, how discoveries are translated and how teams operate, while strengthening human oversight and judgement, as well as the skills and infrastructure needed to use it well. AI can accelerate discovery and execution, but its value will depend on human imagination, scientific rigour, deep domain expertise and clear accountability.

These shifts will better position A*STAR to support and help drive the key thrusts of RIE2030. In particular, the large-scale, mission-driven RIE2030 Flagships and Grand Challenges, in semiconductors, transport and connectivity, healthy longevity and decarbonisation, will concentrate capabilities across the ecosystem on economic and national priorities where coordinated action can make a decisive difference.

A*STAR's strong research capabilities across disciplines, deep links with research and industry partners, and experience translating science into use will enable it to play an active, useful role in shaping and advancing these efforts. RIE2030 builds on Singapore's scientific foundations, talent, partnerships and translational capabilities, defines sharper translational choices, and will require effective execution. A*STAR will double down on its work to further strengthen its research expertise and talent, connect research more directly to need, mobilise the right capabilities around each mission, and turn scientific strength into outcomes that matter for Singapore and the world.

Glossary of Acronyms

6G Sixth-generation Wireless Technology

A*STAR Agency for Science, Technology and Research

AI Artificial Intelligence

AI-RAN Artificial Intelligence Radio Access Network

AIDA Asian Immune Diversity Atlas

AIMfg Sectoral AI Centre of Excellence for Manufacturing

AMF Advanced Micro Foundry

APAC Asia-Pacific

APEX Applied Process Equipment Accelerator

API Application Programming Interface

APOLLO Platform for CT Coronary Angiography for Clinical and Industrial Applications

ARAP A*STAR Research Attachment Programme

ARTC Advanced Remanufacturing and Technology Centre

ATC ATC Globe Holdings

BDH Biomedical Data Hub

BERD Business Expenditure on Research and Development

BII Bioinformatics Institute

BMRC Biomedical Research Council

BMS Biomedical Sciences

BMS IPO Biomedical Sciences Industry Partnership Office

BTI Bioprocessing Technology Institute

CAGR Compound Annual Growth Rate

CAP College of American Pathologists

CATOS Centre for Advanced Technologies in Online Safety

CEAP Centre of Excellence in Advanced Packaging

CFAR Centre for Frontier AI Research

CFS Commonwealth Fusion Systems

CQT Centre for Quantum Technologies

CRUISE Cooperative and Unified Smart Traffic System

CT Computed Tomography

DSO DSO National Laboratories

DxD Hub Diagnostics Development Hub

EDB Economic Development Board

EDDC Experimental Drug Development Centre

Glossary of Acronyms

EV Electric Vehicle

FDA United States Food and Drug Administration

FH Familial Hypercholesterolaemia

FWCI Field-Weighted Citation Impact

GaN Gallium Nitride

GDP Gross Domestic Product

GIS Genome Institute of Singapore

GISAID GISAID Global Data Science Initiative

GUSTO Growing Up in Singapore Towards Healthy Outcomes

HSA Health Sciences Authority

IAIC Institute of Advanced Intelligence and Computing

IDL Infectious Diseases Labs

IEEE Institute of Electrical and Electronics Engineers

IHDP Institute for Human Development and Potential

IHH Integrated Healthcare Holdings

IHI IHI Corporation

IHL Institute of Higher Learning

IMCB Institute of Molecular and Cell Biology

IMDA Infocomm Media Development Authority

IME Institute of Microelectronics

IMRE Institute of Materials Research and Engineering

IND Investigational New Drug

IoT Internet of Things

IP Intellectual Property

IPO Initial Public Offering

ISCE² Institute of Sustainability for Chemicals, Energy and Environment

JTC JTC Corporation

KKH KK Women's and Children's Hospital

LCER CO Low-Carbon Energy Research Coordinating Office

LCT³ Low Carbon Technology Translational Testbed

LLE Large Local Enterprise

LTA Land Transport Authority

MDDI Ministry of Digital Development and Information

MEL Molecular Engineering Laboratory

Glossary of Acronyms

MERaLION Multimodal Empathetic Reasoning and Learning in One Network

MIT Massachusetts Institute of Technology

MNC Multinational Corporation

MPA Maritime and Port Authority of Singapore

MRO Maintenance, Repair and Overhaul

MTI Ministry of Trade and Industry
(known as Ministry of Energy, Trade and Industry as of 1 Oct 2026)

NAMIC National Additive Manufacturing Innovation Cluster

NATi Nucleic Acid Therapeutics Initiative

NCAIP National Centre for Advanced Integrated Photonics

NCCS National Cancer Centre Singapore

NGS Next-Generation Sequencing

NGTC National Gallium Nitride Technology Centre

NHCS National Heart Centre Singapore

NMC National Metrology Centre

NPM National Precision Medicine

NQO National Quantum Office

NQSN National Quantum-Safe Network

NRF National Research Foundation, Singapore

NRP National Robotics Programme

NSCC National Supercomputing Centre Singapore

NSTIC National Semiconductor Translation and Innovation Centre

NTU Nanyang Technological University

NUH National University Hospital

NUHS National University Health System

NUS National University of Singapore

PCR Polymerase Chain Reaction

PIPS Pharma Innovation Programme Singapore

PRECISE Precision Health Research, Singapore

ProSIA Protein Organ-Specific Interactome Analysis

PSA President's Science Award

PSTM President's Science and Technology Medal

PTA President's Technology Award

Q.InC Quantum Innovation Centre

Glossary of Acronyms

R&D Research and Development

RCA Research Collaboration Agreement

RF GaN Radio-Frequency Gallium Nitride

RI Research Institute

RIE Research, Innovation and Enterprise

RNA Ribonucleic Acid

S.U.R.E. Source, Understand, Research and Evaluate

SAESL Singapore Aero Engine Services Private Limited

SARS Severe Acute Respiratory Syndrome

SARS-CoV-2 Severe Acute Respiratory Syndrome Coronavirus 2

SB Singapore Biodesign

SEEDS Startup Enterprise Development Scheme

SEERS Singapore Enhanced Eye-Care Referral System

SERC Science and Engineering Research Council

SG-NEx Singapore Nanopore Expression Project

SG100K Singapore 100,000 Whole Genomes

SGCC Singapore Gastric Cancer Consortium

SGH Singapore General Hospital

SGX Singapore Exchange

SHINE Singapore Hybrid-Integrated Next-Generation Micro-Electronics Centre

SIA Singapore Airlines

SIAEC SIA Engineering Company

SiC Silicon Carbide

SIFBI Singapore Institute of Food and Biotechnology Innovation

SiGN Singapore Immunology Network

SIMTech Singapore Institute of Manufacturing Technology

SINGA Singapore International Graduate Award

SIPGA Singapore International Pre-Graduate Award

SME Small and Medium-Sized Enterprise

SMJL Smart Manufacturing Joint Lab

SNEC Singapore National Eye Centre

SRAP Singapore Research Attachment Programme

SRIS Skin Research Institute of Singapore

SRL Skin Research Labs

Glossary of Acronyms

STEM Science, Technology, Engineering and Mathematics

SUTD Singapore University of Technology and Design

T-Up Technology for Enterprise Capability Upgrading

TCOMS Technology Centre for Offshore and Marine, Singapore

TEU Twenty-foot Equivalent Unit

TIMES Tumour Immune Microenvironment Spatial

TTSH Tan Tock Seng Hospital

USS IEO Urban Solutions & Sustainability Innovation and Enterprise Office

YSA Young Scientist Award

Agency for Science, Technology and Research
2 Fusionopolis Way, Innovis #08-01, Singapore 138634

Email: contact@a-star.edu.sg