

SHAPING INNOVATION, TRANSFORMING TOMORROW

A*STAR ANNUAL REPORT APRIL 2025 - MARCH 2026



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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.

Subsidiary Company

Name of subsidiary company
Accelerate Technologies Pte Ltd (A*cceletrate)

% of shareholdings A*STAR has in company
100%

A*cceletrate is the entity executing license agreements and holding equity in spin-off and investee companies. A*cceletrate has a wholly owned subsidiary, A*cceletrate Venture Creation Pte Ltd (A*VC), an investment holding company. Collectively, A*cceletrate and A*VC hold equity stakes in over 50 spin-offs and investee companies in the biomedical and physical sciences. A*STAR (Suzhou Industrial Park) Co. Ltd is also a wholly owned subsidiary of A*cceletrate. It provides funding and infrastructure to help Singapore companies carry out R&D productisation and expand their market in China through A*STAR Partners’ Centre (A*PC) located in Suzhou Industrial Park.

Subsidiaries of A*cceletrate

- A*cceletrate Venture Creation Pte Ltd
- A*STAR (Suzhou Industrial Park) Co. Ltd

For more information, visit
<https://www.a-star.edu.sg/enterprise>

Our Institutions and Platforms

The agency’s statutory board staff strength is 197^[1]. The broader A*STAR community comprises a total of over 5,600 individuals (as of 31 March 2026), including scientists and researchers, technical and non-technical staff, as well as personnel involved in industry development, commercialisation, and corporate functions.

Biomedical Research Entities

- A*STAR Bioinformatics Institute (A*STAR BII)
- A*STAR Bioprocessing Technology Institute (A*STAR BTI)
- A*STAR Genome Institute of Singapore (A*STAR GIS)
- A*STAR Infectious Diseases Labs (A*STAR ID Labs)
- A*STAR Institute for Human Development and Potential (A*STAR IHDP)
- A*STAR Institute of Molecular and Cell Biology (A*STAR IMCB)
- A*STAR Singapore Immunology Network (A*STAR SigN)
- A*STAR Singapore Institute of Food and Biotechnology Innovation (A*STAR SIFBI)
- A*STAR Skin Research Labs (A*STAR SRL)

Science and Engineering Research Entities

- A*STAR Institute of Advanced Intelligence and Computing (A*STAR IAIC)
- A*STAR Institute of Microelectronics (A*STAR IME)
- A*STAR Institute of Materials Research and Engineering (A*STAR IMRE)
- A*STAR Institute of Sustainability for Chemicals, Energy and Environment (A*STAR ISCE²)
- A*STAR National Metrology Centre (A*STAR NMC)
- A*STAR Singapore Institute of Manufacturing Technology (A*STAR SIMTech)

Joint Institutions

- Advanced Remanufacturing and Technology Centre (ARTC)
- Skin Research Institute of Singapore (SRIS)
- InVivos

National Centres and Programmes

*Platforms managed by A*STAR but funded nationally.*

- AI Centre of Excellence for Manufacturing (AIMfg)
- Biomedical Sciences Industry Partnership Office (BMS IPO)
- Centre for Advanced Technologies in Online Safety (CATOS)
- Consortium Management Office (CMO)
- Diagnostics Development (DxD) Hub
- Experimental Drug Development Centre (EDDC)
- Low-Carbon Technology Translational Testbed (LCT³)
- MedTech Catapult
- National Additive Manufacturing Innovation Cluster (NAMIC)
- Nucleic Acid Therapeutics Initiative (NATi)
- National Quantum Office (NQO)
- National Robotics Programme (NRP)
- National Semiconductor Translation and Innovation Centre (NSTIC)
- National Supercomputing Centre (NSCC)
- Singapore Biodesign (SB)
- Technology Centre for Offshore and Marine, Singapore (TCOMS)
- Urban Solutions and Sustainability Innovation & Enterprise (USS I&E)

^[1] The reported figure is as of 30 September 2025.

Message from Chairman and CEO

A*STAR continues to focus our efforts on building and growing capabilities that strengthen Singapore's competitiveness, resilience and future growth.

A particular area of emphasis this year was the advancement of AI-assisted discovery across multiple areas from advanced manufacturing to biomedical research, supported by A*STAR's investments in Data-AI-Compute capabilities and collaborations with our partners.

Advancing Singapore's Innovation Agenda

In FY2025, A*STAR delivered 1,252 industry projects, with companies investing over S\$830 million in R&D. A*STAR spin-offs also raised more than S\$440 million in follow-on funding.

We doubled down on a portfolio of high-potential research areas where A*STAR has built deep capabilities and strong partnerships.

Our early investments in semiconductor research have enabled Singapore to build strategic capabilities in silicon photonics, a leading technology for optical interconnects that allow more rapid and efficient data transfer between chips.

These capabilities have translated into commercial impact, including the acquisition of A*STAR spin-off Advanced Micro Foundry (AMF) by GlobalFoundries in 2025. GlobalFoundries, a leading semiconductor manufacturing company, has also expanded its research collaboration with A*STAR in advanced packaging and silicon photonics.

The National Semiconductor Translation and Innovation Centre (NSTIC) hosted by A*STAR continued to advance key semiconductor domains. NSTIC (GaN) opened in 2025 and is Singapore's first national facility dedicated to gallium nitride semiconductors. The new material is better suited than traditional silicon-based chips to power electronics and high-frequency radio applications like 5G and 6G communications, radar and satellite communications.

These developments reflect the importance of the long-term sustained investment in R&D which has translated into globally competitive technologies that strengthen Singapore's role in the semiconductor value chain.

In advanced manufacturing, AI is supporting Singapore's next phase of industrial transformation. AIMfg, the AI Centre of Excellence for Manufacturing developed jointly with the Ministry of Trade and Industry, is accelerating the adoption of AI capabilities across product innovation, operations optimisation and sustainable manufacturing.

At Mencast Marine, an SME that produces engineering solutions for the offshore and marine industries, A*STAR's advanced manufacturing and AI capabilities supported improvements in design and additive manufacturing. The collaboration led to a 30% increase in propeller manufacturing productivity, opening new opportunities in global supply chains.

We are excited about our partnership with CuspAI which will bring together frontier AI with A*STAR's materials science capabilities to accelerate the design, synthesis and validation of new materials, enabling discoveries to reach industry more quickly.

We continue to push frontiers in biomedical discovery and human health. The national flagship cohort study on maternal and child health, Growing Up in Singapore Towards Healthy Outcomes (GUSTO), continues to produce valuable data from over 800 active participants. In the last decade, research based on GUSTO data has generated over 400 publications on how early-life factors such as maternal well-being and childhood screen exposure affect children's mental and physical health.

The National Precision Medicine (NPM) programme has entered Phase III with the establishment of the PRECISE Genomic Environment, a data infrastructure that enables clinical-grade genomic data processing and secure integration across research and healthcare systems.

AI is also strengthening healthcare-related research. Fragle, a new AI-based method, analyses the size of tumour DNA fragments in blood to enable faster and more efficient cancer monitoring. In collaboration with NCCS and Lucence, a precision health company, A*STAR is developing UNITED 2.0, an AI-powered cancer profiling platform.

Curiosity-driven science remains central to A*STAR's mission, generating discoveries and capabilities that can be translated into wider benefit for Singapore. One example is a nano-scale biopsy needle developed with collaborators from the National University of Singapore, that enables researchers to track gene activity in living cells over time, opening new possibilities for pharmaceutical R&D.

Nurturing Singapore's STEM Pipeline

At the heart of A*STAR's work and impact are our people. A*STAR's scholarship programmes continue to nurture talent across scientific disciplines, advancing the careers of more than 1,500 scholars, 80% of whom are working on Singapore's Research, Innovation and Enterprise priorities. To further strengthen this pipeline, we launched A*STAR Graduate Scholarship tracks in semiconductors and quantum, as two strategic priorities for the agency.

As we conclude RIE2025 and look towards the next phase of Singapore's innovation journey, we thank our colleagues, scholars, partners, and the wider A*STAR community for their dedication, collaboration and belief in the power of science to make a difference. We look forward to continuing our collective work to pursue breakthrough science, and to turn discoveries into consequential impact.



Professor Tan Chorh Chuan
Chairman

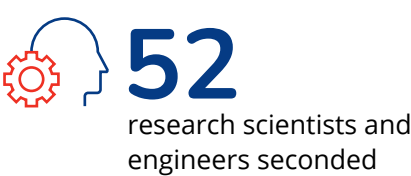
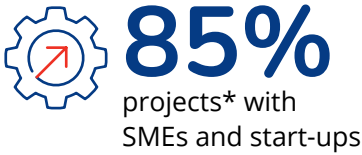
Mr Beh Kian Teik
Chief Executive Officer

FY2025 Key Achievements at a Glance

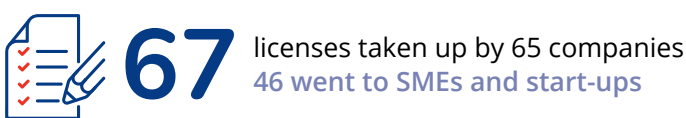
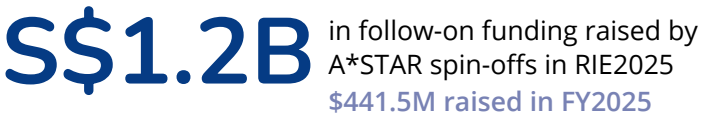
Industry Overview



Supporting Local Enterprises' Productivity and Growth



Strengthening Innovation and Enterprise

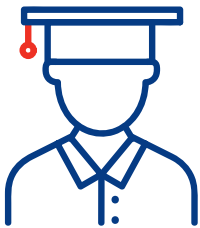
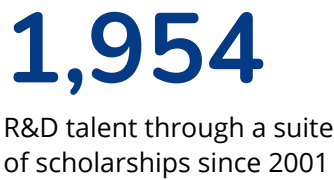


Advancing Quality Science

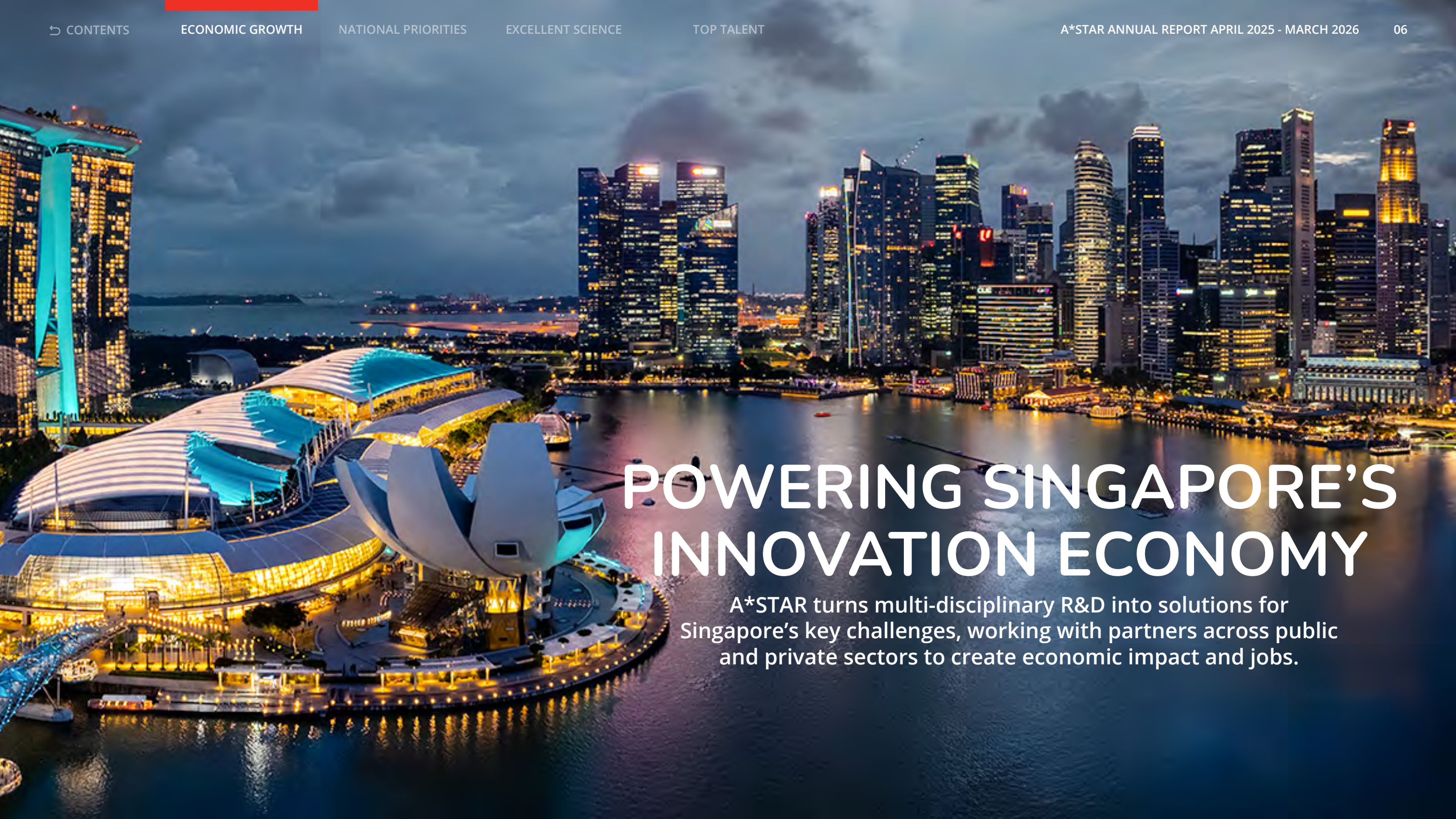


Attracting and Building Pipeline of STEM Talent

As of end FY2025, A*STAR
has built a pipeline of



*Excluded Service-Characterisation, Measurement and Technical Consultancy (C/MTC) projects.



POWERING SINGAPORE'S INNOVATION ECONOMY

A*STAR turns multi-disciplinary R&D into solutions for Singapore's key challenges, working with partners across public and private sectors to create economic impact and jobs.

01

Advanced Manufacturing

Manufacturing contributes about one-fifth of Singapore's GDP and remains a key engine of growth. In RIE2025, investments in AI, additive manufacturing and robotics strengthened Singapore's standing as a global innovation hub. A*STAR helps multinational corporations deepen high-value manufacturing operations here, while enabling local enterprises to move up the value chain.

Moving forward, A*STAR will build on this momentum with smart and sustainable manufacturing solutions that raise productivity, strengthen competitiveness and enhance resilience across high-value sectors such as aerospace, automotive and semiconductors. A significant part of this effort is dedicated to transforming SME business models and integrating them within global supply chains.



Aerospace: A Singapore Success Story

Singapore's aerospace sector is a vital engine of economic growth, with more than 130 aerospace companies spanning across manufacturing, Maintenance, Repair and Overhaul (MRO), R&D and aftermarket services, including local SME suppliers. Today, Singapore accounts for about 10% of global MRO output. As Asia Pacific's airline market expands and passenger numbers are expected to double by 2043, demand for MRO services will continue to grow. Meeting this demand will require the industry to increase capacity without proportional increases in cost, space or labour. To strengthen competitiveness and embed local suppliers more deeply in global supply chains, A*STAR partners Singapore enterprises and MNCs to develop advanced aerospace solutions.

Singapore's early and sustained investments in MRO and advanced manufacturing are helping the sector scale for the next phase of global growth.

Scaling Aerospace Manufacturing for Global Demand

A*STAR, Rolls-Royce and Singapore Aero Engine Services Private Limited (SAESL) will further advance automation, digitalisation and next-generation manufacturing through the second phase of the Smart Manufacturing Joint Lab (SMJL Phase Two). Building on earlier productivity gains, SMJL Phase Two innovations and Rolls-Royce's ongoing improvement initiatives are expected to enable the Fan Blade Singapore facility to increase production by over 30% without expanding footprint. The collaboration will complement SAESL's separate S\$242 million expansion investment, which aims to boost its MRO capacity by 40%, reinforcing its position as the world's largest Rolls-Royce Trent Engine MRO facility. These initiatives will support high-value manufacturing and MRO activities in Singapore, and create opportunities for local SMEs. SAESL's expansion alone is also expected to generate around 500 high-value jobs in Singapore over the next five years.

Strengthening Singapore's Aviation Competitiveness

To support growing global aviation demand, Singapore must strengthen the resilience of its aerospace ecosystem through more reliable operations as well as localised manufacturing and maintenance capabilities. The first phase of the joint labs between A*STAR, Singapore Airlines (SIA) and SIA Engineering Company (SIAEC) brought production of over 100,000 aircraft cabin components back to Singapore, and reduced the time required to produce the parts by 30 to 50%. Concurrently, AI-driven Aircraft Predictive Maintenance solutions were developed to help SIA avert flight delays and Aircraft-on-Ground (AOG) incidents. These were further scaled in the second phase of joint labs to strengthen fleet reliability, accelerate domestic high-value manufacturing, integrate SMEs into the aerospace supply chain, and reinforce Singapore's position as a leading global aviation hub.

01

Advanced Manufacturing



Enabling Sustainable Manufacturing Through Materials Innovation

As high-technology industries adopt more sustainable manufacturing practices, products from smartphones to cars must be designed for easier repair, recycling and reuse. Hence, there is an increasing demand for high-performance adhesive solutions to support secure bonding while enabling controlled removal when needed. A*STAR and tesa — a manufacturer of sustainable adhesive solutions — have established the company's first joint innovation centre in Southeast Asia to develop new polymer concepts for removable adhesive solutions for automotive and electronics industries. The partnership establishes Singapore as a permanent location in tesa's global technology network for Debonding on Demand innovation. Thus, strengthening the country's position as an advanced manufacturing node, while creating opportunities for local manufacturers to adopt and commercialise new design approaches and material technologies.



Building the Factory of the Future

Hyundai is reimagining vehicle production through a corporate lab with A*STAR and NTU. Located within the Hyundai Motor Group Innovation Centre Singapore in Jurong Innovation District, the lab will focus on next-generation manufacturing technologies, including: development of AI technologies for smart manufacturing; robotics technologies to improve production efficiency, quality and worker conditions; 3D printing technologies for auto parts; development of intelligent robotic systems to enhance defect detection and inspection accuracy, minimise equipment downtime, and increase engineer and technician productivity. The partnership bolsters Singapore's position as a mobility innovation and manufacturing hub, develops local talent and supports high-value R&D.



Piloting Smarter, Greener Factories

Improving established manufacturing processes — whether to boost efficiency, meet new regulations or address sustainability requirements — is difficult while actual production is still running. It is like repairing an aircraft mid-flight. A collaboration between A*STAR and Siemens aims to de-risk that process. Called the Smart and Sustainable Advanced Manufacturing Catalyst, it acts as a hands-on demonstration-and-experimentation facility — a test bed where companies can pilot smart, sustainable manufacturing tech in a low-risk setting and then scale what works. It lowers the barrier for a manufacturer to test whether an AI-driven quality system or a “lights-out” fully autonomous production setup actually fits their needs, before rolling it out across their own factories. The aim is to help bridge the gap between frontier research and real-world deployment, helping local manufacturers digitalise and decarbonise operations.



Closing the AI Gap for Manufacturers

Manufacturers often struggle to adopt AI due to limited expertise across AI and manufacturing, fragmented data, and concerns about reliable deployment in industrial environments. To lower these barriers, A*STAR and Microsoft signed an MoU to develop agentic AI solutions, strengthen AI engineering and deployment capabilities, and drive adoption through the Sectoral AI Centre of Excellence for Manufacturing (AIMfg), hosted by A*STAR. The partners also intend to advance AIMie, AIMfg's agentic AI platform, for industrial deployment. Designed to work with manufacturers' existing IT infrastructure, AIMie will enable scalable, reusable AI solutions for predictive maintenance, operations optimisation and quality assurance. The initiative aims to accelerate AI adoption, helping manufacturers raise productivity, improve efficiency and increase manufacturing value-add.

How Singapore is Powering the Next Wave of Global Semiconductor Innovation

Semiconductors are a strategic pillar of Singapore's economy, contributing 6% of GDP. They enable advances in AI, high-performance computing, decarbonisation via power electronics, sensors and actuators, as well as high-speed wireless communications.

In RIE2025, Singapore established the National Semiconductor Translation and Innovation Centre (NSTIC), hosted by A*STAR, to accelerate the translation of critical technologies for the global semiconductor industry. Bringing together researchers and capabilities from A*STAR and the local universities, NSTIC bridges research and industrial-scale production, helping companies shorten development timelines, and reduce the risks of bringing new technologies to market.

The A*STAR-hosted RIE Flagship in Semiconductors under RIE2030 will build on this foundation by setting national R&D roadmaps and strengthening our capabilities in radio frequency gallium nitride (RF GaN), piezoelectric micro-electro-mechanical systems (PiezoMEMS), silicon photonics, flat optics, advanced packaging, power electronics and integrated circuit design.

SIGNIFICANT DEVELOPMENTS IN THE PAST YEAR

Powering National Semiconductor Translation Capabilities

Challenge

Future 6G communications, radar and next-generation satellite systems are expected to operate at higher frequencies, enabling faster data transmission and more compact antennas. These applications require semiconductor technologies that deliver higher power, efficiency and signal quality, and RF GaN is a key enabling technology.

Response

To capture these growth opportunities, A*STAR established Singapore's first boutique foundry for RF GaN prototyping and manufacturing, NSTIC (GaN). In 2025, it became fully operational, alongside newly established electrical and reliability test labs. Together, these capabilities enable companies to prototype, test and validate GaN devices using factory floor production processes.

Impact

In FY2025, the centre released the first version of its 0.25 μm GaN-on-silicon carbide (SiC) Process Design Kit (α -PDK). This allows companies to design products within NSTIC (GaN)'s capabilities which are comparable to leading international GaN foundries. NSTIC (GaN) has attracted six industry partnerships with companies including Incize, and Rohde & Schwarz, strengthening Singapore's position as a trusted hub for GaN innovation and manufacturing.

Accelerating the Path from Prototype to Production

Challenge

PiezoMEMS underpin a wide range of products, from smartphones and industrial sensors to medical imaging devices. However, many high-performance piezoMEMS devices today rely on lead-based materials, resulting in sustainability concerns and limiting future adoption. At the same time, companies face significant challenges translating promising piezoMEMS innovations from the laboratory into manufacturable products.

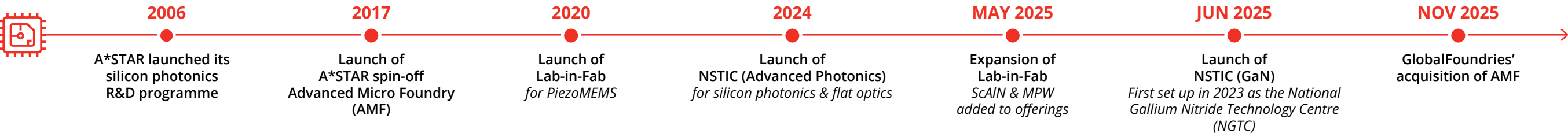
Response

In 2020, A*STAR, STMicroelectronics and ULVAC established the “Lab-in-Fab” joint laboratory, a 200-mm facility that enables R&D and prototyping in a manufacturing environment. This helps companies scale to volume production without recreating and revalidating their processes.

In 2025, the “Lab-in-Fab” was extended for a second phase, which adds lead-free material scandium aluminium nitride (ScAlN) and multi-project wafer (MPW) services to the offerings.

Impact

Through our MPW runs, 12 start-ups, schools and companies across seven countries have developed and tested prototypes more affordably. The new lead-free piezoMEMS technology is currently in development with five companies, validating its potential for real-world applications.



Challenge

Large AI models require huge amounts of data to be moved within a data centre, taking up to 40% of the centre’s energy consumption. To improve the energy efficiency of data centres, one solution is to move data with photons instead of electrons. In delivering ultra-fast, energy-efficient performance, silicon photonics is a promising solution.

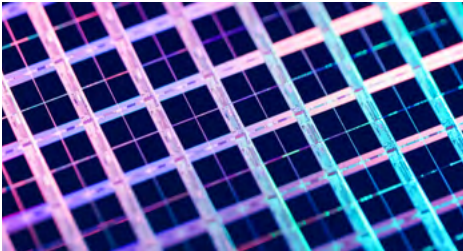
Response

A*STAR launched its silicon photonics R&D programme in 2006. This early investment led to the A*STAR spin-off Advanced Micro Foundry (AMF) in 2017, as the world’s first dedicated silicon photonics foundry to serve the growing silicon photonics market.

Beyond AMF, A*STAR continues to push the boundaries and launched NSTIC (Advanced Photonics) in 2024, with a focus on next-generation silicon photonics and flat optics. In 2025, NSTIC (Advanced Photonics) established Singapore’s first 200-mm thin-film lithium niobate platform capable of supporting future ultra-high-speed ≥ 400 gigabit per second per wavelength optical communication systems. In flat optics, it developed a titanium dioxide-on-glass platform for thinner, lighter meta-lenses.

Impact

Over the years, AMF has brought Singapore-developed silicon photonics innovations to global markets. In 2025, GlobalFoundries acquired AMF. With the acquisition, GlobalFoundries plans to expand production capacity and establish a silicon photonics research and development center of excellence in Singapore to advance the innovation roadmap, strengthening the country’s position as a global silicon photonics hub.



Since its launch, NSTIC (Advanced Photonics) thin-film lithium niobate photonics platform has been developed with Complementary Metal-Oxide-Semiconductor (CMOS) compatible fabrication processes. This allows partners to manufacture their innovations using standard, high volume semiconductor manufacturing processes, significantly reducing production costs and time to market for industry partners looking to scale their technologies. Its titanium dioxide-on-glass platform helped secure two large-scale industry engagements to develop flat optics devices for automotive and consumer electronics applications.

02

Growth of Local Companies

A*STAR is dedicated to building a strong pipeline of innovative local enterprises that will contribute to Singapore’s next bound of growth. This includes translating R&D into competitive advantage through technology transfer, strategic partnerships, and capability building programmes such as Technology for Enterprise Capability Upgrading (T-Up) which seconds A*STAR scientists or engineers as technical advisors.

Under RIE2025, more than 250 SMEs benefitted from A*STAR’s support. These collaborations enabled the integration of 16 companies to the supply chains of MNCs and large enterprises, with Applied Total Control Treatment exemplifying how local companies can scale globally. Looking ahead, RIE2030 raises the ambition to turn research into more economic value and build Singapore enterprises with global reach.



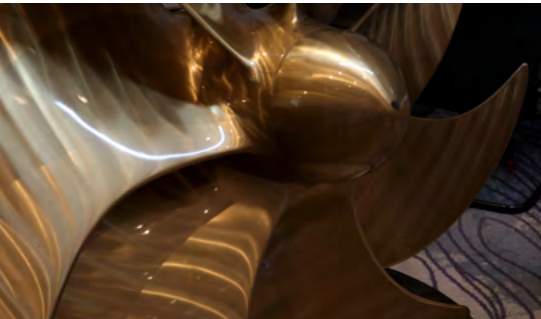
Helping Local Manufacturers Compete Globally Through Joint Labs

As industries become more technology-intensive, local enterprises must innovate faster and build proprietary capabilities to stay competitive. To accelerate this shift, A*STAR launched separate Joint Labs with Applied Total Control Treatment, Abrasive Engineering (AE) and Grand Venture Technologies. These collaborations advance AI-enabled automated surface treatment, high-purity coating technologies and advanced ceramic manufacturing across the aerospace, semiconductor and MedTech sectors. Together, the Joint Labs deepen local enterprises’

innovation capabilities, anchor high-value manufacturing activities in Singapore and help homegrown companies compete more effectively in global markets. In particular, AE and A*STAR have since moved into Phase Two of their joint lab, focusing on the SME’s in-house integration of advanced engineering design and automation. Through the partnership, AE has transformed from a service provider into a technology product owner, driving S\$3.5 million in revenue growth during the joint lab period.

Scaling Local Production with AI-Assisted Design and Additive Manufacturing

Amid increasing global competition, rising costs, an ageing workforce, and growing demand for more efficient marine propeller designs, manufacturers face mounting pressure to optimise operations. A*STAR partnered Mencast to develop next-generation technologies that combine AI-assisted design with robotic Wire Arc Additive Manufacturing (WAAM). This integrated approach aims to enable sustainable, digitally driven production of propellers optimised for improved hydrodynamic performance and fuel efficiency. Building on these co-developed technologies, Mencast continues to industrialise, validate, and refine both the manufacturing processes and AI-assisted design technologies for future commercial deployment. Early pilot implementations have demonstrated the potential to deliver up to 30% improvement in manufacturing productivity, while supporting workforce transformation from traditional foundry operations to advanced digital manufacturing roles.



02

Growth of Local Companies

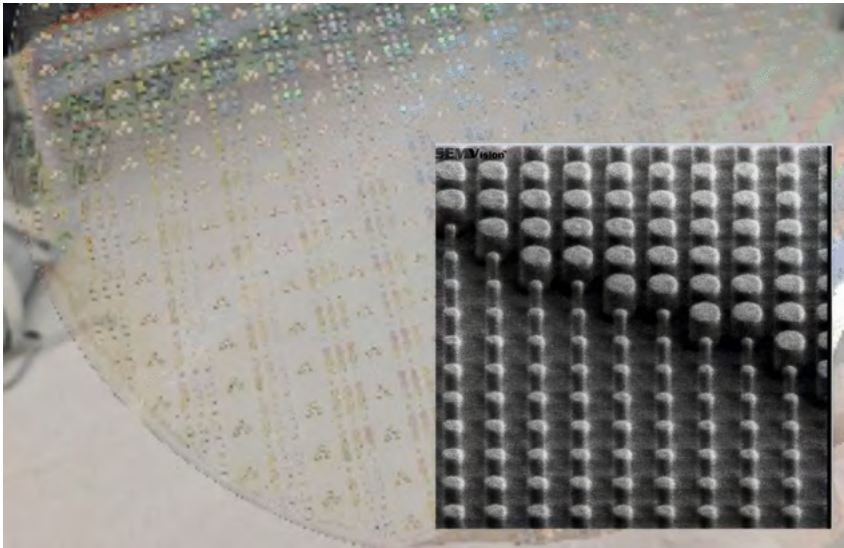


Powering the Future of Singapore’s Digital Economy

Meeting the demand for high-speed internet remains difficult, since conventional fibre-optic networks can be costly and time-consuming to deploy, while existing wireless systems face bandwidth and spectrum limitations. To overcome these challenges, A*STAR supported local deep-tech company Transcelestial through its T-Up program to develop customised precision optics test stations to optimise its proprietary laser communications system. The collaboration achieved a ten-fold reduction in sensor noise, enabled up to 50% faster calibration, and improved long-distance communication performance. By 2025, Transcelestial had deployed more than 150 laser networks across Asia and announced Singapore’s first inter-satellite laser communications mission.

Driving Deep-Tech Scaling and Capital Market Success in Photonics

Conventional optical systems face fundamental limitations in size and accuracy in nanometre-scale fabrication. Flat optics can deliver the same or better optical performances in a smaller size. Hence, it is the technology of choice for compact applications such as AR/VR, 3D sensing, and Internet of Things (IoT) imaging. A*STAR partnered MetaOptics Technologies to co-develop a 4-inch rapid-prototyping, high-resolution Direct Laser Writer that generate “quick turn samples” ready for customer evaluation. The partnership also enabled MetaOptics Technologies to develop meta-lenses for mass production, by adopting a standard semiconductor manufacturing process, deep ultraviolet (DUV) immersion photolithography on 12-inch glass wafers. These initiatives enabled MetaOptics Technologies to successfully commercialise products like 3D biometric sensors and become the world’s first pure-play metalens company to list on the SGX Catalist, raising S\$6 million in a fully subscribed IPO. This demonstrates a clear pathway from publicly funded R&D to international capital markets.



Accelerating Innovation in Gut Health and Functional Foods

As demand grows for functional foods that support gut health, companies face growing pressure to develop products backed by scientific evidence. However, traditional human trials are costly and time-consuming, making it impractical to evaluate every functional food or ingredient.

To meet the need for an effective laboratory-based evaluation tool, AMILI, a precision health company focused on the microbiome, partnered with A*STAR through the T-Up programme to develop the Functional Microbiota Assay (FMA). The in-vitro platform evaluates how specific ingredients impact the human gut microbiome at a fraction of the time and cost of a human trial, while delivering high-resolution insights into changes in microbial composition and function in response to specific ingredients. With the FMA, companies’ commercial leaders can identify likely responder populations while scientific heads can accelerate product development and reduce risk in early-stage R&D.

The FMA enabled AMILI to achieve a six-fold increase in testing scalability, attracting 15 commercial clients and research partners, and generating S\$1.5 million in revenue.

03

Growing Singapore's Deep-Tech Ecosystem

Important breakthroughs sitting in a lab do not translate into commercial ventures on their own. A*STAR helps make that leap. We identify high-potential intellectual property, co-develop solutions for real business challenges, and support licensing and commercialisation. These efforts enable breakthrough technologies to take on a life of their own as globally investible companies that create quality jobs, attract private capital, strengthen strategic industries and deliver real-world impact.

Making Cell Therapies More Affordable and Accessible



Source: AuctuCel

Cell therapies are transforming the treatment of diseases such as cancer by using living cells to target disease. However, they remain costly and difficult to manufacture at scale. One bottleneck lies in the nutrient formulations the cells need to grow. Optimising these formulations is slow, painstaking work, traditionally requiring months of trial-and-error.

Tapping on A*STAR's expertise in culture media development, bioprocess analytics and computational modelling, A*STAR spin-off AuctuCel launched Fluxperior, an AI platform that uses computer simulations to model optimal nutrient requirements without extensive lab testing. The platform reduces cell culture media development time from six months to one, cutting costs by up to 80% and increasing cell productivity by 20%. By reducing the cost and complexity of cell therapy manufacturing, Fluxperior strengthens Singapore's biomanufacturing value proposition and demonstrates the commercialisation of A*STAR-developed technologies.

Strengthening Singapore Food Innovation for Global Markets

Alternative meat and fish products are preferable for consumers conscious about sustainability or animal welfare. However, one challenge is that they have a different fat profile from animal-based products. Consumers also miss out on the health benefits of omega-3 fatty acids. These "healthy fats" have a range of benefits, including enhancing brain function and supporting heart health. The body cannot naturally produce them, making dietary intake or supplements essential.

While sustainable food technologies can reduce environmental impact and strengthen food security, many start-ups face challenges scaling internationally due to funding needs, regulatory complexity, and market access barriers.

Food-tech pioneer ImpacFat, an A*STAR spin-off, is developing the world's first and only stem-cell-derived omega-3-rich fish fat. ImpacFat has secured strategic investments for its expansion into Japan and launched commercial operations for cultivating omega-3 ingredients for food and cosmeceutical applications while owning a global patent across major global markets. Its international expansion demonstrates the potential of Singapore-developed food technologies while beefing up the country's agrifood innovation ecosystem.



Accelerating Industrial 3D Printing with AI

Industrial 3D printing is often costly, with time-consuming trial-and-error cycles required to determine optimal printing parameters for new components. A*STAR developed a proprietary additive manufacturing digital twin platform that combines AI with physics-based modelling to enable manufacturers to optimise component design, material microstructure, mechanical properties and printing parameters in a virtual environment before production. By reducing the need for physical testing, the technology shortens development cycles, minimises material waste and deployment. Facilitated by the National Additive Manufacturing Innovation Cluster (NAMIC), Synacore was spun off from A*STAR to productise and commercialise the technology, as well as foster industry partnerships with A*STAR's Additive Innovation Centre to drive adoption. The collaboration demonstrates how A*STAR and NAMIC connect research with industry to accelerate commercialisation, strengthening Singapore's advanced manufacturing and deep-tech ecosystem, as well as enhancing the nation's competitiveness.

03

Growing Singapore's Deep-Tech Ecosystem

Through A*STAR's venture-building programmes, we connect scientific innovation with entrepreneurial talent, industry partners and global market opportunities — helping deep-tech start-ups achieve commercial success.

RIE2025 achievements reflect growing investor confidence in Singapore-developed innovations. A*STAR-supported ventures have raised more than S\$1.2 billion in follow-on funding since RIE2015.

Accelerating Growth of Promising Robotics Companies



Singapore's robotics and embodied AI sector comprises a growing cluster of high-potential start-ups, yet many struggle to secure funding, navigate go-to-market strategies, and forge essential industry connections. The National Robotics Programme (NRP) launched RoboNexus, a strategic initiative designed to fast-track promising Singapore-based robotics start-ups and SMEs onto the global stage. By aligning agency partners — SGInnovate, Enterprise Singapore and EDBI — with global venture capitalists, RoboNexus provides tailored mentorship, business development, and international market access. EDBI operates under SG Growth Capital, the investment platform of the Singapore Economic Development Board and Enterprise Singapore. Following successful debut, RoboNexus enabled its inaugural batch of participants, such as LionsBot, KABAM Robotics, and XSQUARE Technologies, to strengthen innovation capabilities, expand talent pipelines, drive local adoption, and attract significant industry interest. The collaborative framework of RoboNexus not only empowers individual companies to scale but also solidifies Singapore's reputation as a vital hub for advanced robotics innovation.

Turning Research into Ventures

Launched in 2025, A*STAR's Entrepreneur Partners Programme pairs seasoned entrepreneurs with A*STAR researchers and intellectual property to co-create deep-tech spin-offs that can attract international investment. The initiative began onboarding partners in February 2026, and will continue to strengthen Singapore's innovation ecosystem by accelerating the translation of research into market-ready solutions.



Helping Ventures Go International

A*STAR's Venture Atelier Partners Programme brings together a spectrum of deep science capabilities with leading global venture studios, incubators, and investment firms. Matching high-potential intellectual property with experienced venture builders, the programme accelerates venture development, provides structured training for scientist-entrepreneurs, and drives the focused growth of portfolio companies. Through a growing network spanning therapeutics, MedTech, and Physical Science — including partners like 65LAB, Flagship Pioneering, ClavystBio, and Xora — A*STAR bolsters Singapore's position as a premier node for deep-tech innovation and long-term economic value creation.

04

MedTech

MedTech spans a wide and fast-evolving field of products, devices and systems that help prevent, diagnose, monitor and treat diseases or medical conditions. These range from MRI scanners and joint replacements to diagnostic tests and wearable devices.

Valued at around US\$550 billion in 2025, the global market has a projected growth of 4.5%. A*STAR drives MedTech commercialisation by advancing research and forging partnerships that move innovation from lab to market. These products target conditions such as cancer, where faster, more accurate diagnosis and treatment can make a critical difference.

Growing Globally-Competitive Health-Tech Enterprises

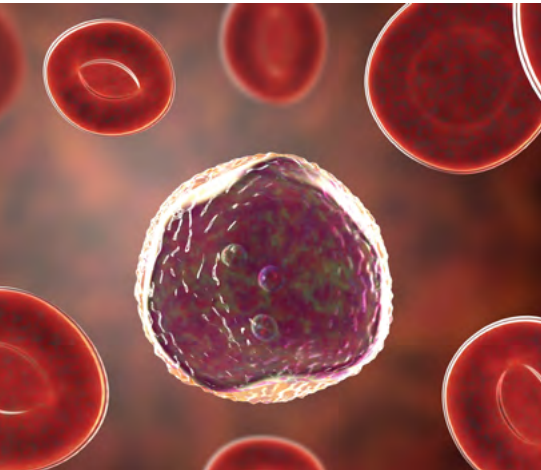
Promising MedTech innovations can struggle to reach the market, held back by funding gaps, limited venture-building expertise and lengthy commercialisation timelines. A new MoU between A*STAR and ClavystBio — a life sciences venture capital investor established by Temasek — aims to address these challenges. The MedTech Venture Partnership combines A*STAR's deep scientific expertise with the specialised productisation and diagnostics development capabilities of the MedTech Catapult and Diagnostics Development (DxD) Hub. Integrating these national platforms with ClavystBio's venture-building experience and potential investors, the collaboration supports start-ups in developing market-fit, regulatory-compliant products



from the outset. Together, they bolster Singapore's MedTech venture ecosystem by turning research into investible companies faster, while helping homegrown health-tech enterprises scale into globally competitive players.

Detecting Cancer Mutations More Accurately with AI Blood Test

Current blood tests for detecting common cancer mutations often require complex and expensive DNA sequencing. Yet, mutations vary between patients, making test results inconsistent and treatment response difficult to track. A*STAR researchers have developed a new AI-based method, Fragle, that makes the tracking of cancer cheaper, easier and faster. It analyses DNA fragment sizes in the blood to reveal distinct patterns that differentiate cancerous DNA from healthy ones. Having demonstrated high accuracy across various cancer types with just a small blood sample, Fragle has entered a clinical study of over 100 patients with A*STAR and NCCS. The technology offers access to affordable cancer monitoring, and creates opportunities for future clinical and commercial deployment.



Enabling Precise Tumour Profiling with AI-Powered Platform



Understanding the precise genetic changes driving a patient's cancer is vital for selecting effective targeted treatments. However, many existing cancer profiling tests do not capture the full complexity of a tumour, limiting treatment selection. To address this gap,

Lucence — a precision health company spun off from A*STAR — is developing a new cancer profiling platform with DxD Hub, and National Cancer Centre Singapore (NCCS). As part of the broader goal of advancing tumour Whole Genome Sequencing for research, UNITED 2.0 will integrate Whole Exome Sequencing and Whole Transcriptome Sequencing, which respectively identify genetic mutations, and measure gene activity in tumours. Together, they will enable more comprehensive tumour profiling to support treatment decisions. DxD Hub and Lucence are also collaborating to develop bioinformatics pipelines, laboratory workflows for a validated laboratory-developed test, and highly sensitive assays for early relapse monitoring. These initiatives strengthen Singapore's capabilities in precision oncology and advance its position as a global hub for precision medicine innovation.

04

MedTech

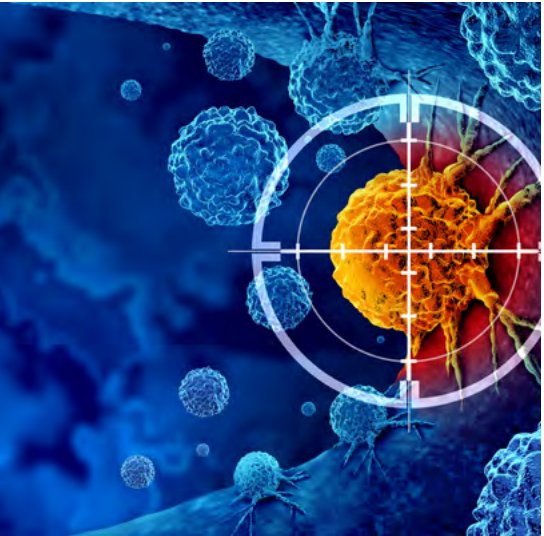
Bringing Diagnostic Tests Direct to Patients

Performing diagnostic tests in a doctor’s office, an ambulance or a patient’s home means quicker decisions about treatment and more convenience for patients. This point-of-care testing (POCT), rather than sending a sample to a lab, is becoming increasingly important in infectious disease, fertility and chronic disease management. However, market expertise and robust validation are required for the commercialisation of these solutions. To plug the gap, DxHub teamed up with multinational diagnostics company CorDx to establish a joint innovation centre at Biopolis. The partnership drives diagnostics innovation with a focus on POCT solutions. By anchoring diagnostic product development and manufacturing activities in Singapore, the collaboration strengthens the local supply chain and end-to-end product development capabilities ecosystem, while enhancing national resilience in diagnostic supplies.



Improving Cancer Care with Predictive Tool

Traditional colorectal cancer treatment is often reactive. Chemotherapy and drugs are prescribed first, before tumour response is observed by doctors. That can mean unnecessary side effects, costs and delays to effective care. A*STAR, NCCS, and an international research team, take a predictive and proactive approach to treatment with CAN-Scan. The machine-learning platform integrates multi-omics — a comprehensive biological blueprint that combines detailed genetic and molecular information — with patient-derived cell lines and drug screening. By comparing a patient’s tumour molecular characteristics with the database, alternative treatments can be identified. The platform advances Singapore’s precision oncology capabilities for personalised cancer treatment, and new drug development.

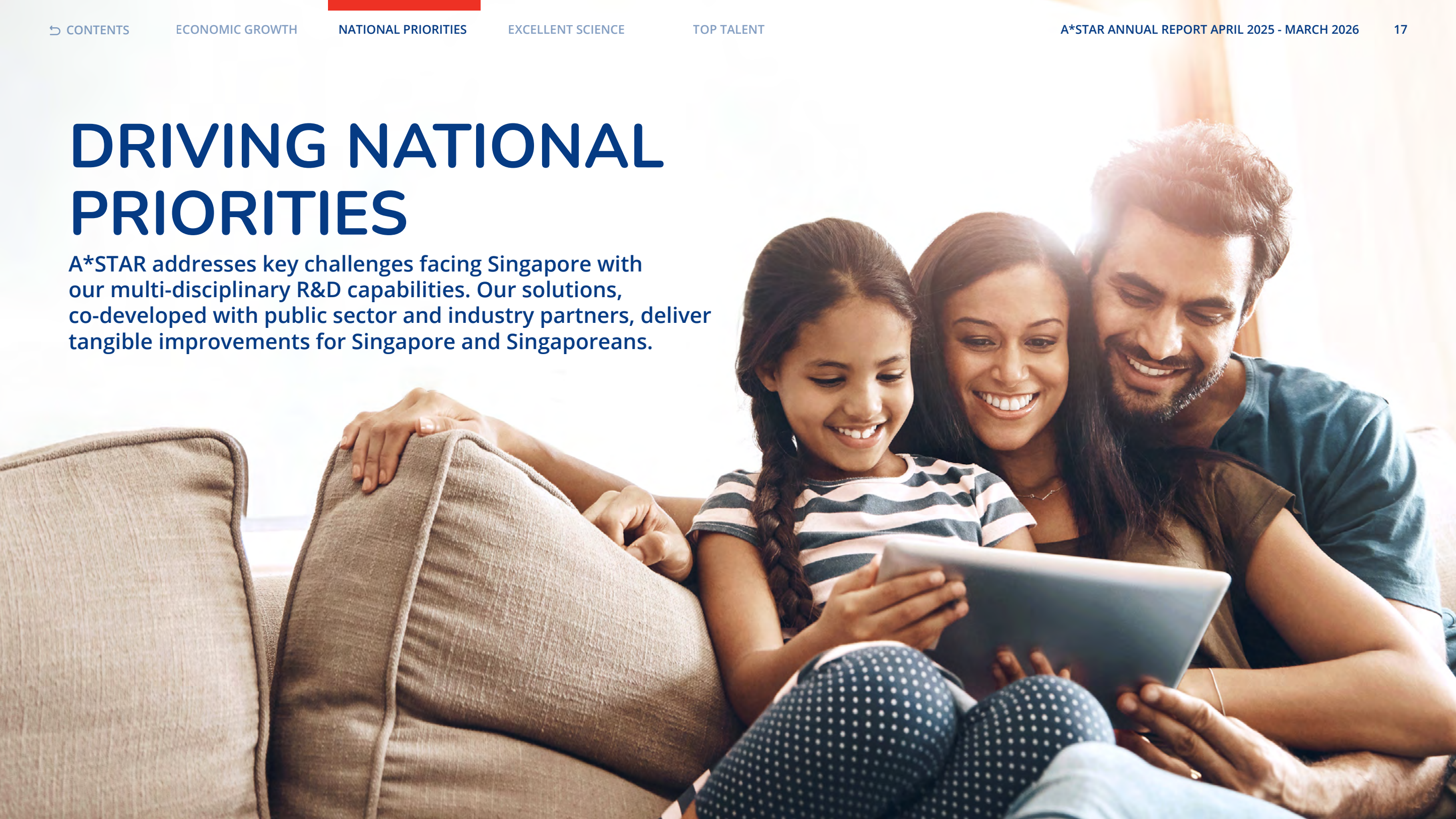


Accelerating Diagnostics for Regional Avian Influenza Preparedness

Rapid response to an outbreak of avian influenza is vital to minimise the threat to public health, as well as disruption to trade and food supply chains. Access to fast, accurate diagnostic kits that can be quickly deployed across the region is critical to pandemic preparedness. DxHub and Japan’s National Institute for Environmental Studies jointly developed the Steadfast H5 Avian Influenza Multiplex RT-PCR Kit. The kit enables the detection of highly pathogenic avian influenza (HPAI) within three hours — significantly faster than conventional sequencing methods, which typically take several days. The kit was used for avian influenza surveillance by the Laboratory for Wildlife Medical Science in Japan, with funding from its Ministry of Environment. Comparing against sequencing results, it demonstrated high diagnostic performance for HPAI. The kit has since been licensed and is being prepared for distribution to surveillance centres, clinics, hospitals, and laboratories across Japan and Southeast Asia.

DRIVING NATIONAL PRIORITIES

A*STAR addresses key challenges facing Singapore with our multi-disciplinary R&D capabilities. Our solutions, co-developed with public sector and industry partners, deliver tangible improvements for Singapore and Singaporeans.

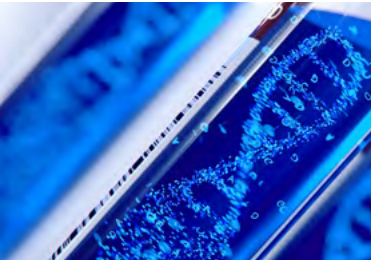


05

Precision Health

Understanding why diseases develop and progress differently amongst individuals is key to improving health outcomes. As a national priority in RIE2030, precision medicine harnesses genomics, AI and health data to enable more personalised, preventive and effective healthcare while opening new opportunities in biomedical innovation. A*STAR supports this effort through its strengths in genomics, population-scale data generation and analytics, helping advance more targeted approaches to prevention, diagnosis and treatment.

Building Singapore’s Genomic Data and Analytics Engine for Precision Medicine



A person’s lifetime disease risk depends on their genetic makeup combined with lifestyle factors such as diet and exercise. Understanding how these elements interact — as well as their impact on the efficacy of treatments — is the goal of precision medicine and preventive care. The aim is to combine deep biological insights from genomics with the power of AI to predict and prevent disease.

Underpinning this approach, the National Precision Medicine (NPM) programme brings together research, healthcare and industry partners to advance precision health. Since 2017, the programme has expanded from

sequencing the DNA of 10,000 individuals in Phase I to 100,000 in Phase II. A*STAR generated, analysed and curated population-scale genomic data while developing reference resources.

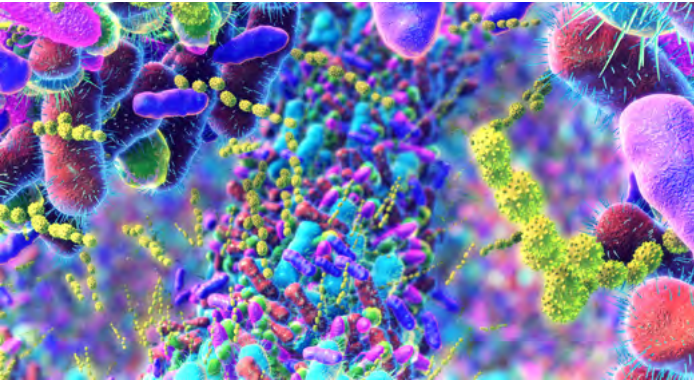
With a strong genomic baseline established through healthy cohorts, Phase III — launched last year — shifts the programme closer to healthcare frontlines. It will study up to 450,000 patients across Singapore’s public healthcare clusters to uncover how genomic insights can improve health outcomes and pilot the integration of genomics data into healthcare delivery. A*STAR is supporting this transition by co-establishing the national genomic data infrastructure for clinical-grade genomic data processing and analytics. This includes setting standards and ensuring that the resulting data can be integrated into the national TRUST also known as Trusted Research and Real World-Data Utilisation and Sharing Tech platform used by researchers across the ecosystem.

Exploring How Microbes in the Digestive Tract Impact the Brain

The ecosystem of microbes that lives inside our digestive systems does not just impact our physical health. Growing evidence links gut microbiome to brain function. Yet, this field of study is still in its infancy, limiting the development of targeted prevention and treatment strategies, particularly in Asian populations.

To address this gap, the Gut Linked Outcomes in Wellbeing study brings together a multi-institutional team of clinicians and researchers including A*STAR, to investigate how the human gut microbiome — sometimes referred to as the body’s second genome — influences mental health.

Building on the NPM programme’s PRECISE-SG100K Cohort, more than 6,000 participants will be recruited.



Microbial signatures and biomarkers from stool, skin, saliva and blood samples will be collected and assessed alongside comprehensive psychological data across Singapore’s major ancestry groups. The findings could potentially lead to more targeted care, new dietary interventions or microbial therapies.

Informing Healthcare Policies Through National Data Platform



Healthcare data must be protected to safeguard patient privacy. But limited access can also constrain research that improves healthcare.

By linking longitudinal data from the Growing Up in Singapore Towards healthy Outcomes (GUSTO) study with national health datasets, A*STAR researchers uncovered new insights into healthcare spending during pregnancy. The study revealed that women without gestational diabetes incurred higher hospital expenses in the final trimester, possibly due to conditions undetected earlier. Enabled by the TRUST platform, A*STAR accessed anonymised health data at scale, turning protected real-world records into actionable insights for evidence-based healthcare planning and policymaking.

Unlocking Human Potential Across Life Stages

By studying how genes, environment and life experiences interact from before birth through adolescence, A*STAR — alongside academic and healthcare institutions — are uncovering the foundations of lifelong physical, cognitive and mental well-being. Through landmark longitudinal cohorts such as Growing Up in Singapore Towards healthy Outcomes (GUSTO) and Singapore Preconception Study of long-Term maternal and child Outcomes (S-PRESTO), researchers are generating Asian-relevant evidence that enables earlier interventions, shapes public policy and strengthens preventive health strategies. Leveraging strengths in population health research and data analytics, A*STAR supports Singapore’s RIE2030 ambitions to improve health outcomes and well-being across generations.



GUSTO: Understanding How Early Life Shapes Future Health

Challenge

Many aspects of lifelong health and development are shaped by conditions during pregnancy and early childhood. Understanding these long-term influences requires long-term data on hundreds of families. However, most global research has been based on Western populations that offer limited insights for Asians.

Response

Launched in 2009, the GUSTO study aims to understand how conditions in pregnancy influence the subsequent health of women and their children, as well as how early childhood environments affect development.

A collaboration between the National University of Singapore, National University Health System, KK Women’s and Children’s Hospital and A*STAR, the results from GUSTO have informed national policy on gestational diabetes and national screen use guidance. As the families at the heart of the research progress through life, the cohort study continues to uncover new insights into the factors that shape health and development across the life course, with findings informing research, policy and potential interventions.

GUSTO FY2025 HIGHLIGHTS

Maternal Well-being Supports Children’s Learning

Mothers with higher depression or anxiety symptoms tended towards strict, punitive parenting or an overly lenient approach with few boundaries. These parenting styles were linked to behavioural difficulties in their children. On the other hand, mothers with higher positive well-being tended to parent with warmth and clear boundaries associated with cognitive benefits for children. However, reducing the mother’s anxiety and depression alone was not enough to optimise a child’s development. Helping mothers to thrive emotionally may be an important lever for children’s early learning.

These were the findings of A*STAR researchers aiming to better understand how a mother’s well-being influences her child’s development.

Early Screen Exposure Linked to Adolescent Mental Health

Many parents use screens to soothe restless children, but little is known about the long-term effects of screen exposure during infancy. A*STAR researchers found that children exposed to prolonged screen time under the age of two had negative consequences later in life. These include changes in brain development linked to increased anxiety and slower decision-making in teenage years. The findings provide locally grounded evidence to inform national health and education agencies as they refine screen use guidance, preschool practices, and public communication on healthy digital habits.



Gender-Specific Pathways of Adolescent Depression

Depressive symptoms often emerge during early adolescence, yet most research focuses on older teenagers, long after early brain and emotional development have taken place. Analysing brain scans from more than 500 children, A*STAR researchers identified differences in how key brain regions developed in boys and girls. Among girls, growth in brain areas involved in emotional processing were associated with symptoms such as low mood and poor self-esteem. Among boys, developments in those brain regions were linked to symptoms including tiredness and feelings of ineffectiveness. The findings could support earlier identification of adolescents at risk of depression and enable more timely interventions.

Regular Sleep Schedule Lowers Obesity Risk

Many children do not get enough sleep during weekdays and try to catch up on weekends. Using sleep data and MRI scans to measure abdominal fat, A*STAR researchers found that only children who consistently met recommended sleep duration guidelines experienced lower obesity risk. The findings reinforce the importance of healthy, regular sleep routines in preventing childhood obesity.

IARP 2.0: Understanding How Adolescent Well-Being is Shaped

Challenge

Adolescent health is shaped by a complex mix of family, school, digital and environmental influences. Yet, few studies track how these factors interact over time, limiting our ability to develop effective strategies that build resilience and improve long-term well-being.

Response

Launched in RIE2025, the Integrative Adolescence Research Programme (IARP) is building one of Singapore’s most comprehensive platforms to understand adolescent development. By integrating data from multiple longitudinal cohorts and new studies spanning early childhood to late adolescence, IARP examines how digital habits, family and school environments, biological factors and environmental exposures shape mental health, physical well-being and academic outcomes.

Impact

These insights will help identify earlier intervention opportunities and inform evidence-based strategies to support healthier, more resilient future generations.

S-PRESTO: Looking Beyond BMI as a Health Marker for Asian Women

Challenge

For many Asian women, the numbers on the scale tell only part of the story. Even with a healthy BMI, some may carry higher body fat, lower muscle mass and reduced bone density, masking significant metabolic and musculoskeletal risks that conventional screening can miss.

Response

Drawing on data from nearly 200 women, A*STAR researchers revealed this hidden health risk affecting one in four normal-weight Chinese women. Launched in 2015, S-PRESTO investigates how women’s health before and during pregnancy influences lifelong outcomes for both mother and child.

Impact

These findings challenge long-held assumptions about healthy weight and reveal critical gaps in how health risks are assessed in Asian populations. By enabling earlier identification of women at risk despite a normal BMI, the research could transform screening and prevention strategies, helping more women maintain stronger bones, healthier muscles and better long-term health.

06

Therapeutics

From drug discovery and diagnostics to treatment selection and disease monitoring, advances in biomedical research are accelerating innovation and enabling more personalised care.

As part of Singapore’s RIE2030 vision, A*STAR is harnessing AI and cutting-edge science to advance next-generation therapeutics, strengthen pandemic resilience and improve diagnostics. By bridging discovery, clinical translation and industry adoption, A*STAR is turning breakthrough research into healthcare solutions that improve lives while cementing Singapore’s position as a global biomedical innovation hub.



Advancing a First Disease-Modifying Therapy into Clinical Trials

LMNA-related dilated cardiomyopathy (DCM) is an aggressive inherited heart disease that rapidly progresses to end-stage heart failure. Through the T-Up programme, A*STAR supported biotechnology company Nuevocor in developing NVC-001, the first disease-specific therapy for LMNA DCM designed to address the underlying mechanobiological root cause of disease. In 2025, NVC-001 received U.S. FDA clearance to begin its first-in-human clinical trial, marking an important milestone in bringing a potential disease-specific treatment closer to patients. The A*STAR spin-off also secured a US\$50 million Series B financing in 2025 to support its clinical development plans in the U.S. and Europe, while advancing its early-stage pipeline and discovery activities in Singapore.

Targeting Singapore’s Deadliest Cancer Through National Research Collaboration

Lung cancer is the deadliest cancer globally, and in Singapore, three people die from the disease each day. Most cases are detected only after the cancer has spread, making it much harder to treat. Unlike the West, where most lung cancer cases are linked to smoking, nearly half of lung cancer patients in Singapore have never smoked.

In response, the national research collaboration Conquering Lung cancer Across all stages with Research and InnovatiON (CLARION) is deepening understanding of lung cancer in Asian patients, while advancing earlier detection and more personalised treatment. A*STAR brings strengths in advanced computational modelling and genomic analysis to help unlock disease insights and accelerate the development of precision diagnostics and targeted therapies.

Supported by the Ministry of Health’s National Medical Research Council, CLARION brings together expertise in medicine, genomics, translational science and data science. Apart from A*STAR, the partners include the National Cancer Centre Singapore, and National University Cancer Institute, Singapore.



RNA enables our cells to read and use the instructions encoded in DNA, playing a vital role in how our cells function. It lies at the centre of many modern medical innovations, from mRNA vaccines to gene therapies. But aspects of its structure and function are still poorly understood. RNA databases present an untapped resource to bridge that gap.

A*STAR researchers have co-developed the RiboNucleic Acid Language Model (RiNALMo), one of the world’s largest RNA language models trained on 36 million non-coding RNA sequences and powered by 650 million parameters. The model can extract hidden knowledge and capture structural information embedded within the RNA sequences.

RiNALMo provides a foundation for AI-driven design and optimisation of RNA molecules. This supports the development of next-generation therapeutics and strengthens Singapore’s capabilities at the intersection of AI and life sciences.

06

Therapeutics

Bridging Research and Manufacturing to Strengthen Vaccine Supply

Vaccine manufacturing increasingly demands processes that are fast, consistent and scalable — while meeting strict regulatory requirements. Achieving that across a global production network is a complex systems engineering challenge.

A*STAR established a collaboration with global pharma company GSK to tackle one piece of that puzzle: developing chemically defined culture media for the Haemophilus influenzae Type B (HiB) cells used in vaccine production. The collaboration draws on A*STAR’s expertise in metabolic modelling and metabolomics to design growth media that outperform conventional alternatives in consistency and yield.

The partnership will enable GSK’s manufacturing facility in Singapore, already a key global supplier of HiB active ingredients for GSK’s conjugate vaccines, to achieve more consistent cell growth, higher yields and reduced media variability. This ultimately would contribute towards more reliable, large-scale supply to global vaccine networks.



Reinforcing Pandemic Preparedness Through mRNA Vaccine Manufacturing Innovation

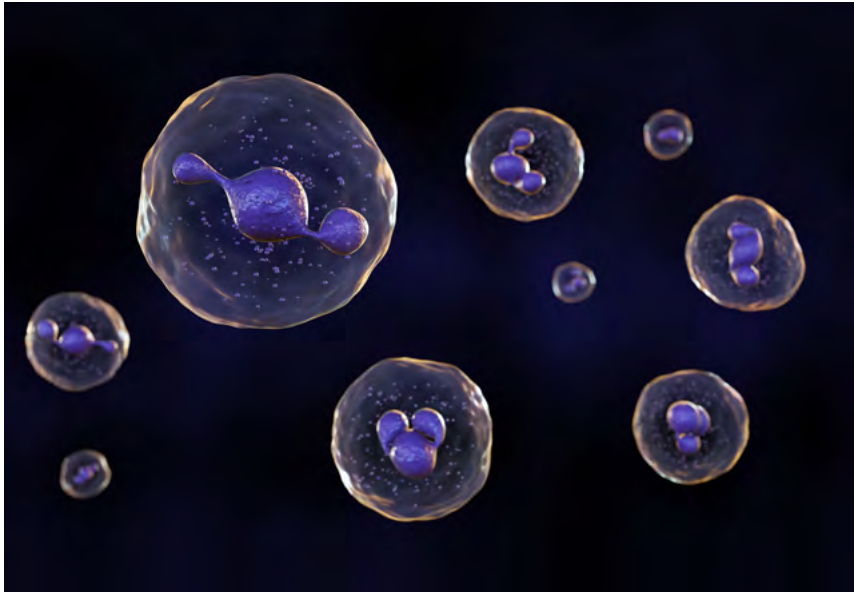
Traditional vaccine manufacturing is complex, expensive and slow to adapt. The COVID-19 pandemic demonstrated the usefulness of platforms based on mRNA that can develop and manufacture vaccines in shorter timeframes.

Building on the launch of Asia’s first-of-its-kind automated mRNA BioFoundry last year, A*STAR is helping to advance these capabilities through participation in the Wellcome Leap RNA Readiness + Response (R3) programme. Together with partners like UK’s Centre for Process Innovation, A*STAR is leading the establishment of one of the world’s few R3G Good Manufacturing Practice (GMP) biofoundries in Singapore. The biofoundry will serve as a test bed for the advanced RNA manufacturing processes.

The initiative positions Singapore as a key node in a globally-connected RNA manufacturing network, and strengthens the country’s pandemic preparedness. By simplifying production and enabling more agile manufacturing, the initiative speeds up next-generation RNA medicine development and strengthens Singapore’s pandemic readiness.

06

Therapeutics



Tracking Changes of Skin Microbes as We Age

Our skin hosts a living ecosystem of fungi, bacteria and other microbes that plays an important role in skin health. However, understanding skin microbe activity and their changes over time remain less clear. To date, A*STAR findings have opened up the possibility of more targeted treatments that slow skin ageing, reduce inflammation and prevent disease.

Attempts to study the skin microbiome have long been hampered by low microbial biomass, along with contamination of samples with human cells, and the inherent instability of RNA molecules. A*STAR researchers have pioneered a metatranscriptomics technique to reliably map the activity of microbes, even in low abundance.

In another study, A*STAR researchers worked with NUS and NTU to analyse data from two long-term Singapore cohort studies spanning children and adults. Their findings reveal dramatic shifts in skin microbial communities across life stages, show how these changes influence skin health through intricate cellular signalling pathways, and guide the future development of novel skin care products.

Offering New Treatments for Chronic Wounds

Wounds that won't heal in older people or patients with diabetes are increasingly prevalent. These wounds can be extremely debilitating and, as societies around the world age, they present a growing public health challenge.

A*STAR researchers collaborated with international research partners to uncover a surprising role for a type of immune cell called neutrophils, in reinforcing the skin's barrier to infection. Besides hunting down microbial invaders in the body, the researchers also found they play a role in strengthening the extracellular matrix, which acts as the skin barrier's scaffolding and communications network.

The study suggests new strategies for wound healing and infection control. By manipulating neutrophil function, it might be possible to accelerate healing in patients with chronic wounds, potentially reducing healthcare costs and recovery times.



Advancing Chronic Wound Treatment to Human Trials

Chronic wounds such as diabetic foot ulcers and pressure sores remain a major unmet need affecting millions of people around the world. They are slow to heal, prone to infection, and can lead to severe complications, including amputations. Current treatments offer limited effectiveness.

A*STAR researchers have co-developed Product Ten, a hydrogel treatment designed to accelerate healing in chronic wounds that traditional therapies struggle to close. Developed using the Perturbed Wound Model, a patented preclinical platform pioneered by A*STAR and NTU, the hydrogel treatment — now named Acelevaé — will enter its first human clinical trial at Changi General Hospital through spin-off Argonaute Lifesciences.

If successful, Acelevaé could improve wound healing outcomes for patients and reduce the risk of complications.

07

Data, AI and Compute Capabilities

Data, AI and advanced computing are powering the next wave of innovation and economic growth. A*STAR is accelerating Singapore’s digital transformation by advancing AI, modelling and simulation, quantum technologies and high-performance computing, translating frontier research into practical solutions. This has delivered breakthroughs from inclusive AI models and trusted digital solutions to quantum computing capabilities.

Advancing Maritime Resilience with AI

Global supply chains face growing disruption from congestion at maritime bottlenecks, extreme weather events and geopolitical shifts. A*STAR is advancing maritime resilience with PSA BDP, a leading global logistics and supply chain solutions provider, and member of the PSA Group. Combining A*STAR’s AI expertise with PSA BDP’s global logistics capabilities, the partnership aims to develop advanced modelling, simulation, and optimisation computational techniques that replicate real-world scenarios. The goal is to help logistics providers, shipping lines and port operators anticipate disruptions and evaluate alternative scenarios with data-driven tools. The initiative demonstrates how A*STAR’s research translates into industry-ready solutions for supply chain resilience, reinforcing Singapore’s position as a leading global trade and logistics hub.

Bridging Materials Design and Real-World Applications

Advanced materials are foundational to technologies ranging from semiconductors and advanced electronics to low-carbon solutions. Yet, translating AI-designed materials into physical ones that can be synthesised and validated quickly remains a major bottleneck in materials science. A*STAR partnered frontier AI materials science company CuspAI to bridge this gap, tapping its AI-driven materials discovery platform to complement the agency’s expertise in materials science and autonomous laboratories. The partnership strengthens Singapore’s capabilities in AI-enabled materials innovation, supporting future advances in semiconductors, advanced electronics and sustainability.

Strengthening Trust in Digital Journalism

As generative AI makes fake news increasingly difficult to detect, A*STAR is strengthening trust in digital journalism with PROVO, an AI-powered content provenance tool. By embedding Coalition for Content Provenance and Authenticity (C2PA) digital credentials into newsroom images and videos, PROVO enables the public to verify their origin and authenticity. In partnership with Mediacorp’s Channel News Asia (CNA), A*STAR is trialling the tool in a pilot newsroom environment, allowing users to distinguish trusted



journalism from fabricated content. The collaboration advances Singapore’s digital trust infrastructure, and supports the responsible adoption of AI to combat misinformation.

Building Inclusive AI for Regional Adoption



Global AI platforms often fail to capture Southeast Asian language nuances, limiting the adoption of large language models in the region. A*STAR is advancing inclusive AI with Multimodal Empathetic Reasoning and Learning in One Network (MERaLiON), a multilingual, conversational model designed for Southeast Asia’s diverse

landscape that is capable of recognising and responding to emotional cues. By integrating regional voice, acoustic and emotional data, MERaLiON understands colloquial languages, interprets code-switched speech and responds with greater contextual awareness. With a consortium of 18 industry partners, including ST Engineering, NCS, DBS, Microsoft and MOH Office of Healthcare Transformation (MOHT), A*STAR is piloting real-world use-cases for this AI platform. Pushing beyond voice AI to multimodal and agentic applications across healthcare, transportation, finance and digital services, the initiative reinforces Singapore’s competitiveness in inclusive and scalable AI technologies.

Shaping the Future of Supercomputing

Quantum computing represents one of the most promising technological developments that could accelerate drug discovery, materials science, financial modelling, logistics and AI. Yet, the field faces critical commercialisation, hardware, and talent gaps. For Singapore, staying ahead of developments in quantum computing is a strategic priority. A*STAR is playing a key role in developing Singapore's quantum ecosystem — translating deep research into real-world applications, building advanced infrastructure and attracting talent, as well as forging partnerships with leading international research institutions and industry.

Positioning Singapore at the Forefront of Quantum Hardware

As the race to realise large-scale quantum computing accelerates, Singapore is advancing the next frontier of quantum hardware. Through a strategic collaboration, Singapore brings together its established semiconductor capabilities, A*STAR-hosted National Quantum Federated Foundry's capabilities in quantum device nanofabrication, and Qolab's expertise in superconducting quantum systems. Spearheaded by the National Quantum Office (NQO)

hosted by A*STAR, the goal is to build scalable, manufacturable technologies that enable industrial-scale fault tolerant quantum computers. Qolab, a quantum computing company, was co-founded by 2025 Physics Nobel Laureate Professor John M. Martinis. By addressing critical hardware challenges, the initiative strengthens Singapore's quantum ecosystem while building on the nation's longstanding strengths in semiconductor capabilities to advance next-generation quantum technologies.

Advancing Singapore's Quantum Edge

Singapore is accelerating the translation of quantum research through a strategic partnership between NQO and quantum computing company Quantinuum. Geared towards driving innovation across sectors such as pharmaceuticals, materials science and finance, the collaboration brings Quantinuum's Helios quantum computer and a new R&D and Operations Centre to Singapore. Providing researchers and industry partners access to leading quantum computing capabilities, Helios is a high-performance system that uses quantum bits (qubits) to perform complex simulations in physics and materials science. Singapore will be the first country outside the US to host the Quantinuum Helios system.

Strengthening Singapore's Role in Global Quantum Innovation

NQO is forging a global network of alliances with leading institutions across Europe and Asia to accelerate the development of next-generation quantum technologies.

Recent collaborations with France, Japan and Sweden exemplify this approach. Building on longstanding France-Singapore ties, NQO and its national-level quantum programmes are advancing research and development in neutral-atom processors, silicon spin-qubit technologies, quantum algorithms and error-correction capabilities with leading entities.

In Japan, a landmark MoU with RIKEN Centre for Computational Science brings together world-leading supercomputing capabilities and Singapore's hybrid quantum-classical platforms to tackle complex challenges in areas covering chemistry, material science, optimisation and fluid dynamics. Meanwhile, a strategic partnership with Sweden links Singapore's quantum community to eleven leading Swedish universities and research institutes, which have committed to promoting collaboration in the field of quantum technology.

Together, these initiatives combine strengths in quantum hardware, algorithms, and high-performance computing to accelerate the development of practical and scalable quantum solutions. They also deepen research collaboration, support talent mobility and reinforce Singapore's position as a key node in the global quantum value chain.

08

Sustainability

As climate change and resource constraints reshape the global economy, A*STAR is advancing scientific capabilities that underpin Singapore's transition to a more sustainable and climate-resilient future. Through breakthroughs in next-generation energy technologies and sustainable materials, A*STAR is enabling industries to accelerate decarbonisation, strengthen resilience and adopt more sustainable practices.

Creating Value from Biomass Waste

As demand for cleaner energy grows, A*STAR advances sustainable battery technologies that support Singapore's transition to a low-carbon, circular economy. In partnership with Singapore-based green energy company GEIH, A*STAR is commercialising a proprietary process that transforms waste feedstock-derived biochar into high-value hard carbon. This material has applications in sodium-ion batteries that power alternative energy storage applications, including grid-scale systems, electric vehicles and consumer electronics. By converting waste feedstocks into a crucial battery material, the technology reduces reliance on critical minerals. In creating value from waste, such advancements in materials science innovation strengthen resource resilience and support Singapore's clean energy ambitions.

Unlocking Clean Energy with Ammonia Innovation

Decarbonising energy-intensive industries requires clean fuels that can deliver reliable power at scale. Through a collaboration with US green energy company Amogy, A*STAR is exploring the potential of ammonia as a low-carbon energy carrier for sectors such as data centres, heavy industry and maritime. Combining advanced catalyst research with ammonia-to-power and ammonia-to-hydrogen technologies, the partnership will demonstrate and validate systems that convert ammonia into electricity on

Singapore's Jurong Island, under real-world operating conditions. These technologies will enable Singapore to decarbonise electricity and hydrogen generation without land, intermittency, transport and storage constraints. The initiative will accelerate the commercial deployment of ammonia-based energy solutions, supporting Singapore's ambitions to build a resilient low-carbon economy and establish itself as a regional leader in clean energy innovation.

Positioning Singapore for the Fusion Economy

Even though fusion energy is moving closer to commercial reality, the global industry still faces a shortage of suppliers for critical reactor components. A*STAR captures early-mover advantages in the emerging fusion energy sector with the launch of its Strategic Tokamak Research for Industrial Deployment and Energy (STRIDE) programme. STRIDE integrates A*STAR's expertise in additive manufacturing, materials engineering, and advanced plasma diagnostic systems. Helping Singapore build the capabilities needed to participate in an emerging global industry, A*STAR also secured a five-year research agreement with Commonwealth Fusion Systems to build expertise that supports commercial fusion power plants. Such initiatives strengthen Singapore's role in the global fusion supply chain, foster specialised talent and generate versatile technologies applicable to adjacent high-growth sectors, including aerospace and precision engineering.



CREATING IMPACT THROUGH EXCELLENT SCIENCE

A*STAR advances science that expands the frontiers of knowledge, and delivers solutions for industry, society, and the world.



Semiconductors and Connectivity Technologies

Delivering record-performance Germanium photodetection for data-centre and AI Interconnects

As modern optical communication networks demand faster data transfer rates, silicon photonics requires advanced photodetectors — light-detecting components — that operate at a high bandwidth to handle massive traffic at high speeds. However, this often compromises their responsivity in converting light to electrical signal and requires complicated fabrication processes. By combining advanced material integration with an optimised design, National Semiconductor Translation and Innovation Centre (NSTIC) researchers developed a germanium-based photodetector that integrates smoothly into standard silicon photonics production lines and demonstrates record bandwidth-responsivity performance.

Xudong Jia, Jiawei Sun, Xuan Sang Nguyen, and Leh-Woon Lim, NSTIC

Enabling mass production of ultra-high-speed optical modulators

In fibre-optic communication systems, thin-film lithium niobate (TFLN) modulators serve as ultra-fast optical switches, encoding digital information onto laser signals by rapidly manipulating the properties of light. Despite their exceptional performance, commercial-scale manufacturing of TFLN modulators has remained a major industry challenge. NSTIC researchers have successfully integrated these advanced modulators onto standard 8-inch wafers using conventional semiconductor manufacturing lines, demonstrating reliable operation, ultra-high-speed performance, and excellent uniformity across the entire wafer.

Yiwen Zhang, Lau Chen, Bo Li, and Landobasa Tobing, NSTIC

Why It Matters



Advancing knowledge: Developed a novel recessed-Ge photodetector architecture by selectively growing high-quality germanium within silicon recesses, enabling simultaneous high responsivity and ultra-high-speed operation.



Technology impact: Achieved a record bandwidth-responsivity product of 121.5 GHz·A/W, combining >100 GHz bandwidth with >1.1 A/W responsivity. This enables optical receivers capable of supporting 400 Gbit/s-per-lane and beyond.



Industry relevance: Demonstrates a manufacturable pathway using standard 200-mm production lines, enabling cost-effective, high-volume deployment of 400 Gbit/s-per-lane optical interconnects for AI infrastructure, hyperscale data centres, and next-generation communication networks.

2026 OPTICAL FIBER COMMUNICATION CONFERENCE AND EXHIBITION >

Why It Matters



Advancing knowledge: Developed a wafer-scale thin-film lithium niobate etching technology with excellent uniformity and reproducibility, enabling the world's first reported fabrication of TFLN modulators on an 8-inch wafer platform entirely within a standard semiconductor manufacturing line.



Technology impact: Establishes a scalable and manufacturable pathway for high-volume production of photonic integrated circuits, delivering bandwidths of up to 110 GHz with excellent wafer-scale uniformity and process reproducibility.



Industry relevance: Enables scalable production of ultrahigh-speed optical transceivers. Ongoing discussions with foundry and product companies highlight its commercial potential for AI infrastructure, hyperscale data centres, and future high-capacity communication networks.

2026 OPTICAL FIBER COMMUNICATION CONFERENCE AND EXHIBITION >

Light-activated ferroelectric materials achieve high-rate strain



Materials that bend or stretch in response to light could be useful in miniature or hard-to-wire environments. But the light responsive materials that can produce a large mechanical strain typically generate deformation too slowly for most use cases. A*STAR researchers, together with collaborators from NTU and NUS, demonstrated that scandium-doped aluminium nitride (AlScN) ferroelectric thin films can achieve photostrictive responses more than 100 times faster than current materials. The high-rate strain response is due to the material's nanoscale polarised structure, enabling rapid light-induced motion without electrical wiring or electrodes. The findings open new possibilities for faster, more efficient light-controlled devices.

Hui Li, and Kui Yao, A*STAR IMRE

Why It Matters



Advancing knowledge: Reveals that nanoscale polar domain architecture plays a critical role in determining photostrictive response speed, offering a new design principle for light-responsive ferroelectric materials.



Technology impact: Enables wireless actuation, remote opto-mechanical interactions.



Industry relevance: Offers potential pathways for future remote micro-actuators, as well as non-contact optomechanical and acoustic systems.

ADVANCED MATERIALS >

Semiconductors and Connectivity Technologies



New light-trapping design enables more compact, energy-efficient lasers

A Bound State in the Continuum (BIC) is a peculiar quantum-optical phenomenon where light becomes

perfectly trapped within a structure. BICs have gained attention as promising elements of lasers, but their practical use is limited because even a tiny deviation from BIC conditions significantly affects Quality Factor — a measure of how the system retains energy. A*STAR researchers with collaborators from France and NTU engineered a BIC in titanium dioxide with a nanostructure composed of an array of tiny pillars. This enabled a high Quality Factor and room-temperature lasing.

Thi Thu Ha Do, Zhiyi Yuan, and Son Tung Ha, A*STAR IMRE

Why It Matters



Advancing knowledge: Shows how metasurface geometry can sustain high-quality optical confinement beyond conventional BIC limitations.



Technology impact: Enables compact, energy-efficient microlasers — potentially useful for integrated photonic circuits, sensing and optical communications.

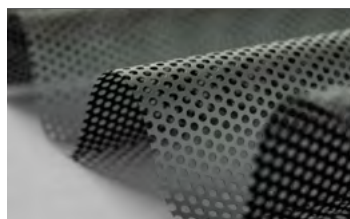


Industry relevance: Supports engineering into more complex on-chip photonic architectures.

[ACS NANO >](#)

Low-Carbon Technologies

Making non-meltable plastics more recyclable



Non-meltable plastics (thermosets) are extremely durable but notoriously difficult to recycle. A smarter type of thermoset called a Covalent Adaptable Network has gone some way to solving that. Instead of permanent, fixed bonds holding the network together,

they have dynamic covalent bonds that can break and re-form, like a reversible zip. That makes recycling or repair possible but only works when joining parts with the same type of dynamic bonds. A*STAR scientists have developed a solid-state reaction that enables thermosets containing different dynamic bonds (C=C and C=N) to break and exchange partners, resulting in the formation of a new seamless bulk recyclable material.

Jie Zheng, and Zibiao Li, A*STAR IMRE

Upcycling polystyrene into high-value industrial ingredients

Polystyrene is widely used in products like coffee cups and foam packaging, but the range of high-value products accessible from this polymer is limited. A major challenge is that the structure of polystyrene makes it difficult to convert into certain valuable compounds, including phthalic anhydride, an important chemical used in the manufacture of plastics, dyes and specialty materials. A*STAR researchers have developed a two-step process that overcomes this limitation by first rearranging the plastic's molecular structure and then converting it into valuable aromatic compounds through oxidation. The approach can directly transform mixed, real-world polystyrene waste into high-purity chemicals that were previously inaccessible from this type of plastic.

Albert Ong, and Jason Y.C Lim, A*STAR IMRE

Why It Matters



Advancing knowledge: Demonstrates a new approach for fusing chemically distinct cross-linked polymer networks, expanding the design possibilities for recyclable and reconfigurable thermoset materials.



Sustainability impact: Enables thermosets to be fused, reprocessed and tuned helps address a persistent source of difficult-to-recycle plastic waste, supporting repair and reuse over disposal.



Industry relevance: Potentially addresses manufacturing constraints, making it more practical to scale up since catalysts add cost and complexity.

[JOURNAL OF THE AMERICAN CHEMICAL SOCIETY >](#)

Why It Matters



Advancing knowledge: Demonstrates that polymer backbone rearrangement can access completely new products for plastic upcycling that could not be achieved via other means.



Sustainability impact: Supports circular economy strategies while lowering reliance on petroleum-derived feedstocks by directly converting mixed, real-world polystyrene waste into industrially important chemicals.



Industry relevance: Phthalic anhydride and related chemicals underpin multi-billion dollar markets in polymers, dyes, specialty chemicals and other polystyrene-like polymers, since phthalic anhydride and related chemicals are central compounds in polymer production.

[ANGEWANDTE CHIMIE INTERNATIONAL EDITION >](#)

New polymer enables safer solid-state batteries

Conventional lithium-ion batteries — found in phones or electric cars for example — are prone to catching fire or exploding because of the flammable liquid they contain. Elastomeric solid polymer electrolytes offer a promising solid-state solution, but they typically have low ionic conductivity which limits their usefulness in batteries. A*STAR researchers in collaboration with NTU MSE developed a novel all-solid-state polymer made up of a string of positively charged units. The lithium ions move through the structure during charging and discharging, combining the advantages of a liquid with the safety and robustness of a solid. This work addresses key barriers to next-generation battery safety and performance.

Sirin Kamarulzaman, Dorsasadat Safanama, Shermin S. Goh, and Derrick W.H. Fam, A*STAR IMRE

Why It Matters



Advancing knowledge: Improves the ion conductivity of the material without compromising on other useful attributes by engineering the chemical properties of the units in the polymer. Enables safer lithium-metal batteries composed of all-solid-state electrolytes with robust mechanical properties and high lithium-ion conductivity.

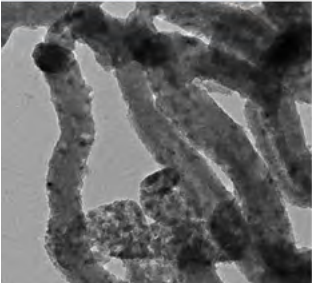


Industry relevance: Simplifies battery assembly, reduces leakage and safety risks with an all-solid-state design. Supporting more sustainable manufacturing and end-of-life recycling pathways.

NANO ENERGY >

Cryogenic microscopy opens up pathway to alternative battery tech

Magnesium batteries have several benefits over the common lithium batteries that power our phones or electric cars, not least a lower risk of catching fire. But magnesium tends to react with a battery's electrolyte, forming an insulating crust of magnesium oxide that stops it charging. A*STAR scientists, in collaboration with teams from USA and China, used cryogenic transmission electron microscopy to investigate how these deposits form at the nanoscale. Their results help to explain how the crusts accumulate and potentially how to prevent them.



Why It Matters



Advancing knowledge: Explains magnesium deposition behaviour by establishing the relationship between electrolyte composition, the chemistry at the electrode surface and the resulting deposit morphology. This is essential for designing electrolytes and electrodes for magnesium-ion batteries based on an understanding of the chemistry, rather than optimisation by trial and error.



Industry relevance: Magnesium batteries are promising due to their high charge-holding capacity, intrinsic safety and the natural abundance of magnesium. Understanding deposition behaviour lowers technical barriers to industrial development of magnesium battery technologies.

NATURE COMMUNICATIONS >

New catalyst design boosts CO₂ conversion into useful chemicals

Making valuable chemicals such as ethylene and ethanol directly from CO₂ could provide a more sustainable alternative to producing them from fossil fuels. Tuning of catalyst-support interactions potentially offers a powerful means to steer CO₂ electroreduction reaction pathways. This can be achieved using specialised catalysts composed of nanoparticles of copper hosted on carbon-based support materials. Now A*STAR researchers, in collaboration with teams from NUS, Taiwan and Australia, have shown that adding fluorine to the support material raises the copper's selectivity for C₂₊ products by five-fold during the direct conversion of dilute CO₂ in simulated flue gas. The fluorine draws electrons away from the copper, making it slightly less electron-dense and better able to facilitate carbon-carbon bond formation.

Meng Wang, and Yanwei Lum, A*STAR IMRE Yuke Li, and Jia Zhang, A*STAR IAIC

Why It Matters



Advancing knowledge: Demonstrates that the material supporting a catalyst is not merely passive scaffolding — its chemical properties can be tuned to improve the catalyst's performance.



Sustainability impact: Offers a pathway to convert CO₂ from industrial emissions into valuable chemicals using renewable energy.



Industry relevance: Engineering the interaction between catalyst supports and copper catalysts provides a simple yet effective strategy to enhance the formation of multicarbon (C₂₊) products such as ethylene and ethanol. There have large markets and are currently produced mainly through carbon-intensive processes.

SCIENCE ADVANCES >

Genomics & Transcriptomics

Stem cell markers, NOX1 and NPY1R, highlight importance of customised colon cancer treatments

Colorectal cancer is currently treated largely as a single disease, with one screening, prevention and treatment strategy. But doctors know that colorectal cancers have distinct patterns of mutations and severity depending on where they arise. A*STAR scientists, along with collaborators from Japan, NTU and NUS showed that cancers occurring at different locations arise from different stem cell populations, and these populations have distinct molecular properties. This suggests that colorectal cancer should not be treated as a single entity but that different regions of the colon could require targeted treatments.

Maxime Gasnier, and Nick Barker, A*STAR IMCB

How keto diet and drug combo could tackle lung cancer

Cancer stem-like cells often survive in nutrient-poor regions of tumours, but how they adapt to dietary changes is not fully understood. Researchers have explored using a ketogenic diet (high in fat, low in carbs) to curb cancer growth. The idea is to starve tumour cells of the energy from sugars that they need. A*STAR scientists, with collaborators from NUS, Duke-NUS, SERI, SGH, NCCS and SIT, showed that lung cancer stem cells — which can regenerate tumours — thrive even when deprived of sugars. Instead, they use fat-derived molecules called ketones as an alternative fuel. The finding suggests a diet-shift combined with drugs that block ketone metabolism could be effective.

Zhengwei Wu, and Wai Leong Tam, A*STAR GIS

Why It Matters



Advancing knowledge: Explains longstanding clinical observations of regional disease heterogeneity by identifying anatomically distinct stem cell populations as cells of origin for colorectal cancer subtypes.



Industry relevance: The region-specific mouse models provide precise systems for preclinical testing of targeted therapies, and biomarker discovery in colorectal cancer research.

NATURE CELL BIOLOGY >

Why It Matters



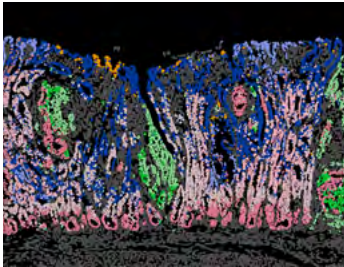
Advancing knowledge: Reveals how lung cancer stem cells adapt metabolically when deprived of nutrients — shifting from sugars to ketones.



Health impact: Provides evidence for a more nuanced interpretation of ketogenic diets in oncology, since dietary interventions are increasingly considered alongside cancer treatment.

CELL METABOLISM >

Identifying hidden cells behind stomach cancer recurrence



Cancer stem cells within tumours are thought to drive relapse, spread and resistance to treatment, but identifying these cancer-sustaining cells has been difficult. A*STAR researchers, with collaborators from Japan, NTU and NUS, identified Aquaporin-5 (AQP5) as a functional marker of gastric cancer stem cells in mouse and human tumours. AQP5-positive cells were able to self-renew, regenerate heterogeneous tumours and drive invasion and metastasis, while AQP5-negative cells lacked these capabilities. Targeted elimination of AQP5-positive cells or inhibition of AQP5 expression blocked tumour initiation and drove regression in established tumours, pointing to a more precise route for tackling gastric cancer at its root.

Grace Lim, Swathi Yada, and Nick Barker, A*STAR IMCB

Why It Matters



Advancing knowledge: Provides direct functional evidence that stomach cancer stem cells with AQP5 are responsible for tumour initiation, maintenance and metastatic spread.



Health impact: Supports therapeutic strategies aimed at preventing relapse, rather than shrinking tumour mass, by pinpointing the specific cell population that drives tumour recurrence.



Industry relevance: Enables diagnosis and drug development, as AQP5 functions both as a marker for identifying cancer stem cells and a driver of tumour regeneration.

SCIENCE >

New microbiome analysis could transform the diagnosis of skin conditions



Understanding the skin microbiome requires knowledge of our microbiome species and their functions. This helps clarify their role in skin conditions such as eczema or acne. A*STAR researchers have developed a robust workflow that sequences all the RNA messenger molecules being produced by these microbes, enabling better analysis of microbial gene expression. By capturing these patterns that DNA-based profiling cannot reveal, the approach helps clarify how bacteria and fungi contribute to skin conditions.

Minghao Chia, and Niranjan Nagarajan, A*STAR GIS

Why It Matters



Advancing knowledge: Establishes metatranscriptomics as a method for analysing the skin microbiome. It enables direct measurement of microbial activity rather than abundance.



Health impact: Improves understanding of how skin microbes influence inflammation, barrier function and conditions such as dermatitis and acne, by identifying active microbial pathways.



Industry relevance: Deepens understanding of how therapeutics, cosmetics and hygiene products modulate microbial function, supporting dermatology, personal care and biotechnology applications.

[NATURE BIOTECHNOLOGY >](#)

Nano-scale biopsy needle enables longitudinal gene activity tracking in living cells

Gene expression studies reveal which genes are active in a cell, but conventional methods usually require breaking cells open, preventing researchers from tracking the same cells over time. A*STAR researchers and collaborators from NUS have developed a non-destructive technique to sample RNA repeatedly from living cells. It uses nanostraws that act as nanoscale biopsy needles. This enables longitudinal transcriptomics, allowing researchers to observe how gene activity changes during drug response, stress, disease progression or the emergence of resistance.

Ying Jie Quek, and Giulia Adriani, A*STAR SgN

Why It Matters



Advancing knowledge: Improves understanding of cellular responses to drugs, stress and disease progression through longitudinal analysis, especially transient states and resistance development.



Industry relevance: Allows incorporation into drug screening and precision medicine workflows, with compatibility for live cells and standard laboratory systems, making it well-suited for pharmaceutical R&D.

[ACS NANO >](#)

p52-ETS1 as a drug target for allergic immune responses

Transcription factor complexes like p52/Relb act as molecular switches that turn on the process of transcribing specific genes. A*STAR scientists discovered that p52 forms a new transcriptional complex with ETS1 to regulate B cell differentiation, and antibody responses without its traditional partner Relb. Together they activate immune responses that drive allergic reactions. The p52-ETS1 complex therefore represents a potential target for drugs to treat a range of B-cell mediated diseases. These findings reveal an important mechanism that helps control immune activation and provide new insights into how immune and allergic responses are regulated.

Dhakshayini Morgan, and Vinay Tergaonkar, A*STAR IMCB
Biyang Zhang, and Kong-Peng Lam, A*STAR SgN

Why It Matters



Advancing knowledge: Reveals an additional layer of immune control through understanding p52's mechanism of action and its interaction with other transcription factors.



Health impact: Drugs that inhibit the p52-ETS1 complex, and prevent it from switching on transcription could help protect against allergic responses, including potentially fatal anaphylaxis.

[NATURE IMMUNOLOGY >](#)

Advanced Manufacturing

Nanoparticle approach prevents cracking in 3D-printed aluminium alloys

3D-printing is widely used to manufacture precise and complex-shaped components. But the technique is not well-suited to high-strength aluminium alloys used in demanding applications such as aircraft components. In the aluminium alloy AA7075, the laser printing process can cause the metal to solidify in a highly directional way and concentrate certain alloying elements in local regions. These effects make the printed material vulnerable to cracking. A*STAR scientists, and collaborators from China, developed a method to embed ceramic nanoparticles in the alloy powder. These particles help the aluminium solidify more evenly during printing, producing a finer grain structure and reducing crack formation. With suitable heat treatment, the printed alloy achieved much better strength and ductility, making this a promising route for 3D-printing high-strength aluminium components.

Tian-Shu Liu, Youxiang Chew and Chaolin Tan, A*STAR IMRE

Why It Matters



Advancing knowledge: Clarifies how ultra-low concentrations of in-situ nanoparticles influence solidification, recrystallisation and precipitation during additive manufacturing.



Manufacturing impact: Enables additive manufacturing of high-strength aluminium alloys previously considered unsuitable for printing by suppressing cracking and expanding the process window.



Industry relevance: Minimises cost and processing complexity to support applications in aerospace, automotive and advanced manufacturing sectors seeking lightweight, high-performance components.

[JOURNAL OF MATERIALS SCIENCE & TECHNOLOGY >](#)

Smart Materials and Microsystems

Microscopic drum skin design delivers humidity sensing breakthrough

Humidity detection has uses in environmental monitoring, healthcare and manufacturing, but current technologies have limitations. A*STAR researchers, working with STMicroelectronics, have developed a new sensor design. It incorporates a tiny scandium-doped aluminium nitride diaphragm which acts like a microscopic drum skin. As humidity changes, a zinc oxide layer swells and applies stress to the diaphragm. This causes it to vibrate differently depending on the humidity level. This is a fundamentally different sensing mechanism from conventional designs which achieves a Figure of Merit more than an order of magnitude higher than the prior state-of-the-art, alongside fast response times and excellent selectivity across a wide humidity range.

Jihang Liu, and Yao Zhu, A*STAR IME

Why It Matters



Advancing knowledge: Establishes stress-based transduction as a fundamentally more sensitive sensing mechanism than established humidity-sensor designs.



Societal impact: Improves environmental management, manufacturing process control, building operations and healthcare settings with more accurate and responsive humidity monitoring.



Industry relevance: Enables detection of other gases or vapours by modifying the sensing layer, broadening its use in industrial and environmental monitoring.

[SENSORS AND ACTUATORS: B. CHEMICAL >](#)

Artificial Intelligence



Algorithm-pruning technique creates leaner AI models

Large neural networks that underpin AI models can be improved by pruning weights — the values learned during training — that contribute little to a model's output. Cutting redundancy reduces computational and energy load, making them easier to deploy on mobile devices, for example. A*STAR researchers have discovered a property of the way model output degrades as each layer is pruned that makes it much easier to optimise the process. Testing on an AI trained in 3D object recognition showed that the pruned model ran four times faster with no drop-off in capability.

Kaixin Xu, Zhe Wang, and Min Wu, A*STAR IAIC

Why It Matters



Advancing knowledge: Deepens theoretical understanding of how neural network layers contribute to output degradation.



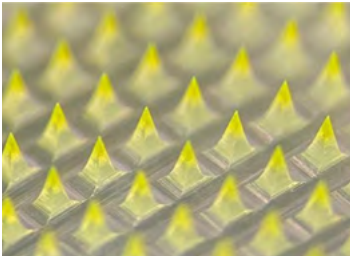
Technology impact / Industry relevance: Enables sophisticated AI models to be deployed on mobile devices and in the real world.

[IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE >](#)

Biomaterials

Stick-on microneedle patch could replace painful injections

Microneedle patches are promising medicine delivery devices, as they offer a minimally invasive way to deliver medicines through the skin. However, their tiny needle tips limit dosage and do not work well for drugs that incorporate large protein molecules such as interferon or vaccines. A*STAR scientists developed a microgel-integrated microneedle array patch that allows more protein to be held in the needle tips while protecting it from temperature variations. This addresses a key barrier to using microneedle patches for vaccines, interferon and antibody therapies.



Bae Ki Hyun, A*STAR BTI
Kun Liang, A*STAR SRL
with collaborators from IBB and A*STAR IMCB

Why It Matters



Advancing knowledge: Demonstrates a strategy to reduce dosage limitations and stabilise fragile proteins, addressing a key technical barrier to using microneedle patches for protein-based drugs.



Health impact: Improves patient compliance with needle-free delivery, reducing reliance on trained personnel. Also avoids the need for cold-chain transportation and storage of medicines — crucial for public health in regions with poor infrastructure.



Industry relevance: Supports diverse prophylactic and therapeutic applications, from vaccine delivery to protein-based medicines and therapies.

SMALL >

Immunology

Mosquito saliva worsens Chikungunya infection

When a mosquito bites, it injects a host of chemicals in its saliva that help it feed, for example by dilating blood vessels and preventing blood clotting. Mosquito saliva is also known to worsen infection with the chikungunya virus, which causes severe joint pain and fever. But the mechanism was poorly understood. A*STAR researchers, with collaborators from NUS, NTU and NCID, have found that a small protein called sialokinin reduces the activity of immune cells that help control infection while weakening the body's virus-specific T-cell response. The work reveals a potential route to reducing the impact of chikungunya and related mosquito-borne diseases.

Siew-Wai Fong, and Lisa F.P. Ng, A*STAR IDL

Why It Matters



Advancing knowledge: Provides a molecular basis for how sialokinin modulates host immune responses and contributes to chikungunya disease severity. The findings are relevant to mosquito-borne diseases in tropical regions, where chikungunya remains a significant and potentially worsening public health concern.



Health impact: Supports therapeutic or vaccine-based strategies that reduce disease severity, not just transmission, by targeting vector-derived factors such as sialokinin.

NATURE COMMUNICATIONS >

Population Health

Parental engagement shapes how screen time affects child development



For years, public health guidance focused on limiting children's screen time due to concerns it was bad for development. But a more nuanced understanding of media exposure is needed. A*STAR scientists found that parental engagement during media use, rather than screen duration or rule-setting alone, has a direct positive association with prosocial behaviour in preschool children. When parents discuss characters, emotions or conflict resolution with their children, screen experiences can support social development. The findings shift attention from how long children watch screens to how adults actively engage with them during media use.

Xuejiao Chen, and Wei-Jun Jean Yeung, A*STAR IHDP

Why It Matters



Advancing knowledge: Challenges duration-focused models of screen exposure by demonstrating that parental involvement is the dominant factor influencing developmental outcomes.



Health impact: Supports a more balanced, evidence-based public guidance, helping to reduce anxiety around screen use while emphasising active engagement.



Industry relevance: Suggests implications for education technology, parenting programmes and child development policy frameworks.

BMC PUBLIC HEALTH >

NURTURING TOP TALENT

Talent is the lifeblood of a vibrant ecosystem. A*STAR cultivates research and entrepreneurial talent to advance discovery, translate innovation, and deliver impact — strengthening Singapore's research, innovation, and enterprise landscape.



National Awards

President’s Science Award

Prof Lisa Ng, A*STAR IDL and Biomedical Research Council

Recognised for pioneering contributions to viral immunology, advancing the understanding of arboviruses such as Chikungunya, and strengthening global pandemic preparedness. Prof Ng has led significant translational breakthroughs in diagnostics, vaccine strategies, and global public health responses to emerging viral threats.



President’s Technology Award

Prof Ng Geok Ing, NSTIC

Recognised for advancing Singapore’s capabilities in radio-frequency Gallium Nitride (GaN) technologies, enabling local manufacturing capabilities and nurturing talents in the strategic semiconductor domain. Professor Ng has been instrumental in advancing Singapore’s national capabilities in III-V compound semiconductors, particularly GaN, culminating in the creation of a national platform that positions Singapore among global leaders in GaN technology.

Young Scientist Award

Dr Chan Yi Hao, A*STAR IDL

Recognised for research on viral encephalitis that advances the understanding of how the brain defends itself against life-threatening viral infections. His research seeks to understand why individuals respond differently to infections (like SARS-CoV-2 and COVID-19), uncovering genetic factors and immune mechanisms that shape susceptibility and outcomes.

IES Prestigious Engineering Achievement Award 2025

A*STAR IAIC

Dr Yau Wei Yun, Dr Albertus Adiwahono, Mr Chen Tai Pang Lawrence, Ms Brina Shong, Mr Yeshas Thadimari, Mr Tan Chong Boon, Mr Chen Yuda, Mr Lee Men Huang, Dr Nursultan Imanberdiyev, Mr Ng Kam Pheng , Dr Efe Camci, Mr Mohammad Asif Bin Abdul Sahid, Dr Saurab Verma, Mr Syed Zeeshan Ahmed Mukhtar, Mr Chan Jian Le, and Mr Zhang Kun

In partnership with the Home Team Science & Technology Agency (HTX)

Project: Autonomous Collaborative Patrolling Robots

Recognised for developing collaborative patrolling robots that advance intelligent systems for public safety and operational efficiency, with real-world applications in autonomous patrols, officer mobility, and frontline security operations.

L’Oreal-UNESCO For Women in Science Singapore

Dr Beverly Mok, A*STAR IMCB

Recognised for advancing RNA-based therapeutic strategies for inherited retinal diseases and rare genetic disorders.

Dr Liu Jinyue, A*STAR GIS

Recognised for developing RNA technologies to map brain connectivity, advancing understanding of neural systems.

Singapore 100 Women in Tech

**Dr Freda Lim, Ms Maria Therese Quieta, Dr Yin Haiyan, and Dr Qian Hangwei, A*STAR IAIC
Dr Fan Yan, A*STAR NMC**

Recognised for excellence in technology and innovation, demonstrating leadership and impact while inspiring greater participation of women in the tech sector.

MTI Firefly Award 2025 - Borderless Award (Silver)

A*STAR Laboratory, Cleanroom & Management (LCaM)

In partnership with JTC and the Singapore Economic Development Board

Recognised for their adaptive repurposing of existing infrastructure to establish NSTIC (R&D Fab) through cross-agency collaboration, delivering state-of-the-art shared cleanroom facilities at significantly reduced time and cost, while strengthening Singapore’s semiconductor competitiveness.

MTI Firefly Award 2025 - Borderless Award (Bronze)

A*STAR NMC

In partnership with Maritime Port Authority (MPA)

Project: Developing a Standardised Data Integrity Inspection Method and Protocol for Digital Bunkering Systems

Recognised for developing a standardised data integrity inspection protocol for digital bunkering systems, enhancing transparency, safeguarding a critical industry, and reinforcing Singapore’s leadership as a global bunkering hub.

MTI Firefly Award 2025 - Exemplary Firefly Award (Silver)

Prof Koh Boon Tong, A*STAR BTI

Recognised for strategic leadership in advancing translational R&D and galvanising biomedical capabilities to drive industry partnerships, strengthening Singapore’s nucleic acid therapeutics ecosystem, and positioning Singapore in next-generation RNA manufacturing.

MTI Firefly Award 2025 - Innovative Project/Policy (Gold)

[A*STAR ARTC, IAIC, IMRE, NMC and SIMTech](#)

Project: Smart Manufacturing Joint Lab (SMJL)

Recognised for improving Rolls-Royce's fan blade production through advanced manufacturing technologies, achieving significant productivity gains, generating industry opportunities, and strengthening Singapore's aerospace ecosystem.

MTI Firefly Award 2025 - Innovative Project/Policy (Silver)

[A*STAR IAIC](#)

Project: Aircraft Predictive Maintenance Technology

Recognised for advancing AI-enabled predictive maintenance to enhance aircraft reliability, reduce operational disruptions, and strengthen Singapore's position as an aviation hub.

International Awards

MIT Technology Review Innovators Under 35 (TR35)

Asia Pacific 2025

[Dr Li Bofan, A*STAR ISCE²](#)

Recognised for developing smart, recyclable membrane systems for sustainable water and chemical purification. Dr Li has advanced greener separation technologies that reduce waste, extend membrane lifespan and improve efficiency in industrial purification processes.

Asia Women Tech Leaders Award 2025

[Dr Nancy Chen, A*STAR IAIC](#)

Recognised for advancing ethical and inclusive AI technologies through innovations in large language models, expanding access and impact across diverse communities.

International Magnesium Science and Technology Award for Innovative Process of the Year 2025

[Dr Sharon Nai, Dr Hang Li Seet, and Dr Mojtaba Salehi, A*STAR SIMTech](#)

Project: Digital Manufacturing of Personalized Magnesium Implants via Binder Jetting and Automated Post-Machining

Recognised for advancing additive manufacturing through digital fabrication of personalised magnesium implants. The innovation has enabled high-precision, biodegradable biomedical solutions tailored to patient needs.

Emerging Investigators by the Journal of Materials Chemistry A

[Dr Wang Jianbiao, A*STAR IMRE](#)

Recognised for developing novel sodium-ion battery materials through structural innovation, advancing energy storage performance and sustainability.

Asia Photonics Technology Innovation Award

[Prof Malini Olivo, Dr Zhang Ruochong, Dr Poongkulali Rajarhm, Dr Qi Yi, and Dr Bi Renzhe, A*STAR SRL](#)

Recognised for developing an innovative handheld confocal Raman skin analyser, advancing sustainable photonics technologies and diagnostic capabilities.

International Fellowships

American Association for Cancer Research (AACR) Academy Fellow

[Prof Ashok Venkitaraman, A*STAR IMCB](#)

Recognised for pioneering research on BRCA2 and genome maintenance, advancing understanding of breast cancer development and enabling new therapeutic strategies.

Associate Member at European Molecular Biology Organization (EMBO)

[Dr Wan Yue, A*STAR GIS](#)

Recognised for outstanding research excellence in RNA science, including developing high-throughput approaches to map RNA structures and interactions across diverse systems, deepening understanding of gene regulation and enabling new avenues for disease-targeted RNA technologies.

Fellow of the Royal Society of Chemistry (FRSC)

[Dr Julian Chan, A*STAR ISCE²](#)

Recognised for sustained contributions to chemical sciences, including innovations in plastic upcycling for sustainable materials.

IEEE-Eta Kappa Nu (IEEE-HKN) Professional Membership

[Dr Nancy Chen, A*STAR IAIC](#)

Recognised for outstanding contributions to engineering, leadership, and service, demonstrating excellence in scholarship and professional impact within the IEEE community.

Fellow of the International Speech Communication Association (ISCA) 2025

[Dr Nancy Chen, A*STAR IAIC](#)

Recognised for transformative contributions to speech communication, including multilingual speech processing and multimodal human-machine interaction.

Major National and International Grants

NRF Competitive Research Programme (CRP) 32nd Grant

Dr Wu Wei, A*STAR SigN

Exploiting Tumor-specific RNA-editing for Antigen-based Cancer Therapy (EXTRACT)

Dr Sherry Aw, A*STAR IMCB

Mechanistic understanding of a programmable RNA-sensing ribozyme to develop a platform for cell context-specific release of non-coding RNA therapeutics

NRF Competitive Research Programme (CRP) 33rd Grant

Dr Jayantha Gunaratne, A*STAR IMCB

NICHES: Niche-Driven Immuno-evasion and Metastasis in High-risk Cancer Subtypes for Effective Stratification

Prof Lam Ping Koy, A*STAR Q.InC

Quantum Data Storage and Transduction for Scalable Quantum Technologies

NRF Thematic Competitive Research Programme (CRP) 2025 Call

Dr Ivan Verzhbitskiy, A*STAR Q.InC

Atomic Scale Engineering of Nonreciprocal Devices Towards THz Sensing

Dr Yau Wei Yun, A*STAR IAIC

Biologically Inspired Embodied AI Action Architecture

Dr Zhang Yong-Wei, A*STAR IAIC

Predictive Platform for Thermal Transport in Advanced Nanoengineered Systems

National Medical Research Council (NMRC) Individual Research Grant and Young Individual Research Grant

[25 A*STAR researchers](#) were awarded the funds to nurture basic, translational and clinical research that are relevant to human health and potential.

Manufacturing, Trade and Connectivity (MTC) Individual Research Grant and Young Individual Research Grant

[11 A*STAR researchers](#) were awarded for both grants which support novel and fresh R&D investigator-led ideas in the manufacturing, trade and connectivity domain sectors.

4th Science of Learning (SoL) Grant Call

Dr Cai Shirong, A*STAR IHDP

Environments of Adolescents on Sleep and socio-Emotional development (EASE)

Dr Alicia Salamanca Sanabria, A*STAR IHDP

Digital InteRvention to promotE Adolescent sleep, learning and Mental well-being (DREAM)

MTC Programmatic Fund

Dr Kai Dan, A*STAR ISCE²

Developing Liquid Wood Resin for Sustainable Specialty Polymers

Dr Ken Lee, A*STAR ISCE²

Sustainable Chemistry for High-Value Glycoside Products via Traceless Activation

Other Awards and Recognition

50th International Exhibition of Inventions Geneva (Silver Medal)

Prof Malini Olivo and Dr Renzhe Bi, A*STAR SRL

Recognised for developing a handheld Raman probe with enhanced sensitivity and portability, enabling improved molecular detection for clinical diagnostics and field applications.

AAAI-26 (Association for the Advancement of Artificial Intelligence)

Best Demonstration Awards

Dr Fang Fen, Dr Yang Muli, Dr Yang Xulei, and Dr Li Zhengguo, A*STAR IAIC

Dr Liang Xinan, Dr Tobias Mass, and Dr Xu Xuewu, A*STAR IMRE

Project: Next-Generation Metalens Vision System: Powered by AI and Applied to AI

Recognised for developing an end-to-end AI-powered metalens vision system integrating advanced imaging and machine perception capabilities.

Clarivate Highly Cited Researchers 2025

Dr Chen Jinmiao, A*STAR BII

Dr Fu Huazhu, Prof Ong Yew Soon, and Prof Zhang Yong Wei, A*STAR IAIC

Dr Seh Zhi Wei, A*STAR IMRE

Dr Xi Shibo, A*STAR ISCE²

Dr Yang Yi Yan, A*STAR BTI

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World's Top 2% Scientists by Stanford University

Career Long Impact 2024, 77 A*STAR staff were recognised

Single Year Impact 2024, 112 A*STAR staff were recognised

Organisation Details

Board Secretary

Dr Wendy Soon, Director, Strategic & Corporate Planning

*A*STAR*

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