Agency for Science, Technology and Research

SINGAPORE

IMPACT THROUGH INNOVATION

ANNUAL REPORT APRIL 2023 - MARCH 2024

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Happy, Homely, Happening A*STAR

Key Performance Indicators

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ABOUT A*STAR

OUR MISSION

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.

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OUR VISION

A global leader in science, technology and open innovation.

A*STAR is a catalyst, enabler and convenor 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.

MESSAGE FROM THE CHAIRMAN AND CEO

mpact through Innovation" encapsulates our continued journey this past year towards being a strategic innovation engine for Singapore. Our researchers and partners continue to pursue scientific and technological excellence, and translating these into practical solutions that address national challenges, foster economic growth and improve lives.

Strengthening online safety has emerged as a critical national priority. To bolster Singapore's defences, we established the Centre for Advanced Technologies in Online Safety (CATOS) with support from the Ministry of Digital Development and Information (MDDI)¹ and the National Research Foundation (NRF). CATOS is at the forefront of developing robust capabilities to combat online harms, content manipulation, and Al-generated threats. These efforts complement existing regulatory efforts and ground-up initiatives, ensuring Singapore users are safeguarded in the digital realm.

Strong partnerships are pivotal in translating scientific breakthroughs into impactful solutions for Singapore and Singaporeans. Through the SingHealth-A*STAR Healthcare Translation Partnership, we are collaborating with the Singapore National Eye Centre (SNEC) and the Singapore Eye Research Institute (SERI) on terahertz imaging for eye disease detection. Furthermore, we are working alongside SERI to advance AI research to improve ophthalmological care for patients.

To foster a circular economy and advance a greener future, we launched a new Electric Vehicle (EV) Battery Testing and Disassembly Line, tapping on the expertise of McKinsey & Company to implement Industry 4.0 technologies into the line. This collaboration enhances safety standards for battery disassembly, and standardises the handling of retired battery packs before repurposing, recycling, or disposal.

We established five new deep tech translation platforms and initiatives to catalyse key sectors in Singapore's economy. The National Semiconductor Translation and Innovation Centre (NSTIC) will boost R&D in flat optics and silicon photonics, allowing enhanced performance and efficiency for semiconductor devices. The Nucleic Acid Therapeutics Initiative (NATi) 🕏 will position Singapore as a regional leader in RNA drug and vaccine development and grow our RNA manufacturing capabilities. The MedTech Catapult will build ISO13485 facilities to accelerate the development of novel science tools and medical devices, and grow a robust MedTech ecosystem for Singapore. The RoboCluster initiative by National Robotics Programme (NRP) & will enhance robotics R&D in manufacturing, logistics, facilities management, and healthcare. The AI Centre of Excellence (CoE) for the Manufacturing Sector , jointly developed by the Ministry of Trade and Industry (MTI) and A*STAR, will convene stakeholders from industry, research, and the startup scene to develop Al-enabled solutions that address use cases, with plans for expansion to other sectors. This is how A*STAR will support Singapore in pushing the frontiers of innovation across the economy.

We continue to build the national talent pipeline through scholarship programmes that have developed over 1,800 R&D talents since 2001. We would like to express our deep appreciation to previous Chairman, Ms Chan Lai Fung, who stepped down in October 2023 for her leadership and dedication to helping A*STAR fulfil its mission, and her tireless support of research and innovation in Singapore.

Looking ahead, we will continue to harness our collective strengths across research institutes, centrally facilitated programmes and national programmes to deliver increasing impact, at scale and at speed.

Professor Tan Chorh Chuan Chairman Mr Frederick Chew Chief Executive Officer

¹ Formerly the Ministry of Communications and Information (MCI)

BOARD MEMBERS (AS OF 31 MARCH 2024)



Professor Tan Chorh Chuan Permanent Secretary (National Research and Development) Permanent Secretary (Public Sector Science and Technology Policy and Plans Office), Prime Minister's Office Chairman, A*STAR Chairman, MOH Office for Healthcare Transformation (MOHT) Chair, Healthier SG Implementation Office, MOH



Mr Frederick Chew Chief Executive Officer, A*STAR Chief. Public Sector Science and Technology Policy and Plans Office, Prime Minister's Office



Mr Ashok Belani Senior Strategic Advisor, New Energy Schlumberger Limited



Professor Barry Halliwell Chairman. BMRC Advisory Council (BMAC), A*STAR





Professor Isaac Ben-Israel

Workshop for Science Technology and

Interdisciplinary Cyber Research

Center and the Yuval Ne'eman

Security, Tel Aviv University

Director of The Blavatnik

Chairman, Boards of Biocortex Bioscience Catalyst



Managing Partner, Skyviews Life

Science SA

Dr Benjamin Koh Deputy Secretary (Sustainability), Ministry of Sustainability and the Environment (MSE)



Deputy Chief Executive Officer,

Temasek International Pte. Ltd.

Professor William Chin

Bertarelli Professor of Translational Medical Science and Medicine Emeritus, Harvard Medical School



Mr Arunjai Mittal Independent Director



Mr Adrian Chua Deputy Secretary (Development), Ministry of Finance (MOF)





Ltd. Brainomix Ltd and Stevenage





Ms Cindy Lim Chief Executive Officer. Infrastructure, Keppel Ltd





Mr Sopnendu Mohanty Chief Fintech Officer, Monetary Authority of Singapore (MAS)



Professor Sir John O'Reilly Chairman, Science and Engineering Advisory Council (SEAC), A*STAR



Ms Jacqueline Poh Managing Director, Economic Development Board



Mr Quek Gim Pew Senior R&D Consultant, Ministry of Defence

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Mr Ravinder Singh Group Chief Operating Officer, Technology & Innovation, ST Engineering President, Defence & Public Security, ST Engineering



LLP





Ms Yong Hwee Yee Vice President, Integrated Supply Chain Global Pharmaceuticals and Compounding, Baxter Healthcare

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A*STAR SENIOR MANAGEMENT (AS OF 31 MARCH 2024)



Mr Frederick Chew Chief Executive Officer, A*STAR



Mr Suresh Sachi Deputy Chief Executive (Corporate), A*STAR General Counsel, A*STAR



Professor Tan Sze Wee Assistant Chief Executive, Biomedical Research Council (BMRC), A*STAR Senior Advisor, Innovation & Enterprise (I&E) and National Platforms, A*STAR



Professor Ng Huck Hui Assistant Chief Executive, Research and Talent Development, A*STAR Chief Scientific Advisor, Institute of Molecular and Cell Biology (IMCB), A*STAR



Professor Lim Keng Hui Assistant Chief Executive, Science & Engineering Research Council (SERC), A*STAR



Professor Yeo Yee Chia Assistant Chief Executive, Innovation & Enterprise (I&E), A*STAR



Mr Haryanto Tan Assistant Chief Executive, Policy Plans & Infrastructure, A*STAR



Professor Sir John O'Reilly Chairman, Science and Engineering Advisory Council (SEAC), A*STAR



Professor Ong Yew Soon Chief Artificial Intelligence Scientist, A*STAR President's Chair Professor of Computer Science, Nanyang Technological University (NTU)



Professor Andy Hor Deputy Chief Executive (Research), A*STAR



Professor Lam Ping Koy Chief Ouantum Scientist, A*STAR



Professor Barry Halliwell

A*STAR

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Chairman, BMRC Advisory Council (BMAC),

Senior Advisor, Academic Appointments

Senior Deputy President and Provost, Tan

Chin Tuan Centennial Professor, National University of Singapore (NUS)

and Research Excellence, Office of the

Professor Yeoh Lean Weng Chief Sustainability Officer, A*STAR Executive Committee Member. Institute of Sustainability for Chemicals, Energy and Environment (ISCE²), A*STAR Senior Director, Urban Solutions and Sustainability, National Research Foundation (NRF)



Mr Christopher Leck Chief International Partnerships Officer,

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A*STAR



ORGANISATION CHART



SUBSIDIARY COMPANY

Name of subsidiary company

Accelerate Technologies Pte Ltd (A*ccelerate)

% of shareholdings A*STAR has in company 100%

A*ccelerate is the entity executing license agreements and holding equity in spin-off and investee companies. A*ccelerate has a wholly owned subsidiary, A*ccelerate Venture Creation Pte Ltd (A*VC), an investment holding company. Collectively, A*ccelerate and A*VC hold equity stakes in over 45 spinoffs and investee companies in the biomedical and physical sciences. A*STAR (Suzhou Industrial Park) Co. Ltd is also a wholly owned subsidiary of A*ccelerate. It provides funding and infrastructure to help Singapore companies carry out R&D and expand their market in China through A*STAR Partners' Centre (A*PC) located in Suzhou Industrial Park.

Subsidiaries of A*ccelerate

- A*ccelerate 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 A*STAR community encompasses a broad spectrum of research areas, spanning biomedical sciences, physical sciences, and engineering. As of 31 March 2024, our community comprises over 5,900 individuals, 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 Infectious Diseases Labs (A*STAR ID Labs)
- A*STAR Skin Research Labs (A*SRL)
- Bioinformatics Institute (BII)
- Bioprocessing Technology Institute (BTI)
- Genome Institute of Singapore (GIS)
- Institute of Molecular and Cell Biology (IMCB)
- Singapore Immunology Network (SIgN)
- Singapore Institute for Clinical Sciences (SICS)
- Singapore Institute of Food and Biotechnology Innovation (SIFBI)

Science and Engineering Research Entities

- Institute for Infocomm Research (I²R)
- Institute of High Performance Computing (IHPC)
- Institute of Materials Research and Engineering
 (IMRE)
- Institute of Microelectronics (IME)
- Institute of Sustainability for Chemicals, Energy and Environment (ISCE²)
- Singapore Institute of Manufacturing Technology (SIMTech)

Joint Institutions

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

National Platforms

Platforms managed by A*STAR but funded nationally.

- Biomedical Sciences Industry Partnership Office (BMS IPO)
- Consortium Management Office (CMO)
- Diagnostics Development (DxD) Hub
- Experimental Drug Development Centre (EDDC)
- Low Carbon Energy Research Coordinating Office (LCER CO)
- National Additive Manufacturing Innovation Cluster (NAMIC)
- National Gallium Nitride Technology Centre (NGTC)
- National Metrology Centre (NMC)
- 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)

to boost R&D translation

in flat optics and

silicon photonics for

semiconductor devices

FY2023 AT A GLANCE



to position Singapore as a regional leader in RNA drug

Industry Overview

industry projects undertaken with companies, public sector agencies, and IHLs







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Advancing Quality Science

A*STAR publications average Field-Weighted **Citation Impact** in RIE2025





As of end FY2023. A*STAR has built a pipeline of

R&D talent through a suite of scholarships since 2001

Strengthening Innovation and Enterprise



S\$251.6M



Contributing to Public Sector Transformation

266

projects undertaken with public sector agencies and IHLs

of follow-on funding



Attracting and Building Pipeline of STEM Talent





INNOVATING FOR ECONOMIC GROWTH

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A*STAR uplifts the capabilities of local companies and strengthens the ecosystem. Our role in forging strategic partnerships helps position Singapore as a global innovation hub, attracting investments and creating high-value jobs for Singaporeans.



BOOSTING ADVANCED MANUFACTURING AND TRADE & CONNECTIVITY FOR SINGAPORE

Steering AI Technology Research in the Maritime Industry

A*STAR spearheaded innovations in sustainability, safety and efficiency of Singapore's maritime ecosystem by <u>developing advanced digital solutions for smart shipping</u>, <u>port systems and decarbonisation</u>[®]. Hosted under A*STAR's Centre for Maritime Digitalisation (C4MD), a master agreement framework was inked between American Bureau of Shipping (ABS), Bureau Veritas Marine & Offshore, ClassNK, METIS Cyberspace Technology (Singapore) Pte Ltd, MTI Co. Ltd., PSA Marine (Pte) Ltd and ShipsFocus Services Pte Ltd to develop and deploy AI technologies for the maritime industry.



Increasing Resilience against Supply Chain Disruptions



▲ DSVC will drive the adoption of digital technologies, moving the industry towards autonomous manufacturing

A*STAR, in partnership with NTU, has launched the <u>novel Distributed</u> <u>Smart Value Chain (DSVC) programme</u> to increase the competitiveness of Singapore manufacturers and enhance their resilience to large supply chain disruptions. The programme fosters a collaborative network among manufacturers, enabling seamless data sharing and real-time decisionmaking to unlock new business opportunities by filling resource gaps through the value chain.

BOOSTING ADVANCED MANUFACTURING AND TRADE & CONNECTIVITY FOR SINGAPORE

Advancing Sustainable Manufacturing at Jurong Innovation District

In partnership with JTC, A*STAR has <u>relocated</u> the facilities of SIMTech and National Metrology <u>Centre (NMC)</u> to the Jurong Innovation District (JID). This move aligns with JID's vision of a unified advanced manufacturing ecosystem, fostering collaboration among SMEs, startups and MNCs. A*STAR will co-develop high value manufacturing technology, enhance human capital and improve measurement accuracy to promote fair trade, a safer environment, productivity and product reliability, supporting Singapore's Net Zero goal.

"A key piece of our efforts today is to provide a mutually reinforcing ecosystem, giving more local companies a boost in innovation."

Mr Tan Boon Khai, Chief Executive Officer, JTC



Enhancing Maritime Transport and Supply Chain Management

A*STAR collaborated with Singapore Maritime Institute (SMI), Research Institutes of Sweden (RISE) and Vinnova to launch the <u>Networked Virtual Watch</u> <u>Tower (NVWT)</u>. This digital solution leverages AI technologies to optimise resources for supply chain stakeholders to make better decisions when coordinating operations, streamlining processes, achieving cost efficiency and improving productivity. This initiative marks the first step in establishing Singapore as a digitalised smart port within the global supply chain.



▲ Signatories at the MoU signing to build collective intelligence and collaborate globally along end-to-end transport corridors



▲ Coca-Cola Singapore and A*STAR launched a collaborative robot solution to automate Coca-Cola's packing lines for its bags of powdered ingredients

Streamlining Beverage Manufacturing with Robot Solution

In collaboration with Coca-Cola and local small and medium-sized enterprise (SME), Kowa Skymech Pte Ltd, A*STAR developed a customised collaborative robot (cobot) solution[®] to automate Coca-Cola's powdered ingredient packing process. With a smart vision detection system and an expandable end-of-arm tool, the cobot significantly increases productivity and upscaling potential, while reducing manual labour required to fulfil production.

BOOSTING ADVANCED MANUFACTURING AND TRADE & CONNECTIVITY FOR SINGAPORE

Refining Satellite-Based Maritime Communications



▲ A model of the successfully launched Lumelite-4

Maritime communication systems face limitations in bandwidth, range, and accuracy. In a joint effort, A*STAR and NUS College of Design and Engineering (NUS CDE)'s Satellite Technology and Research Centre (STAR) successfully launched a <u>microsatellite for maritime</u> <u>communications</u>. This achievement marks the first demonstration of maritime applications for VHF Data Exchange System (VDES) in Southeast Asia, allowing A*STAR to validate key technologies that could enhance communication and operational efficiency.

Pioneering 3D-Printed Satellite Components

A*STAR and NTU successfully built and launched the <u>VELOX-AM (Additive Manufacturing) satellite</u> into space to test the viability of using 3D-printed parts for complex satellite components. This achievement marks a significant step in advancing Singapore's space industry capabilities.

▼ The VELOX-AM satellite is a collaborative endeavour between NTU Singapore and A*STAR that aimed at testing how 3D-printed parts can be used effectively to produce complex satellite companies. Image credit: NTU



Advancing Singapore's EV Manufacturing Capabilities

As Singapore and the Southeast Asian region embrace the electrification of transportation, there is a greater need for manufacturing capabilities to meet growing demands. A*STAR led the <u>Electric</u> <u>Traction Module Open Technology Platform Collaborative Industry Project (E-TraM OTP CIP)</u> with 10 industry partners[®] to build local capabilities in manufacturing electric drivetrains, a component in EVs. This initiative will also focus on optimising torque performance and energy efficiency, as well as scalability of the technology.



E-TraM OTP CIP Programme Ceremony with our partners: Akribis Systems Pte Ltd, BorgWarner Singapore Holdings Pte Ltd, Giken Sakata (S) Limited, Infineon Technologies Asia Pacific Pte Ltd, ION Mobility Pte Ltd, MMI Holdings Limited, Neo Performance Materials (S) Pte Ltd, Nidec Singapore Pte Ltd, Proterial Asia Pacific Pte Ltd, and Sanwa Plastics Industry Pte Ltd

Building a Hydrogen Ecosystem in Singapore

Renewably sourced hydrogen has drawn interest from the automobile industry as a low-carbon alternative to fossil fuels such as coal and natural gas. As such, A*STAR partnered with Hyundai Motor Group and NTU to create a Corporate Lab that aims to accelerate innovations in Singapore's mobility ecosystem, as well as support the adoption of new technologies. The parties signed a MoU at the opening of the Hyundai Motor Group Innovation Centre Singapore (HMGICS).



▲ A*STAR, NTU Singapore and Hyundai Motor Group sign MoU for future mobility innovation

Boosting SMEs' Competitiveness across Sectors

A*STAR launched three new advanced manufacturing joint labs with industry partners — M8M, Mencast and MiRXES. These joint labs exemplify the synergy between A*STAR's research institutes and local companies to develop and deploy new technological solutions in their respective industries, better positioning each enterprise to tackle business challenges and enhance competitiveness within their sectors.

Tapping into China's Expanding Healthcare Market with Robotics

A*STAR Partners' Centre (A*PC) in Suzhou Industrial Park has helped Singapore-based tech companies, <u>Vivo Surgical and AiTreat Robotics</u> enter the Chinese market. Vivo Surgical will continue to develop its robotic surgery products, while AiTreat Robotics industrialises its soft tissue massage technology products to support the demand for healthcare services and medtech products in China. A*PC's robust support system and network have enabled close to 40 Singapore-based tech companies to successfully enter the Chinese market.

Strengthening Innovation and Economic Ties with Vietnam



A*STAR and Vietnam's National Innovation Centre (NIC) inked a MoU to <u>collaborate on advanced manufacturing</u>, providing local SMEs and startups access to Vietnam's growing market. This partnership will promote cooperation between the two countries, paving the way for future initiatives in energy connectivity, sustainability and innovation.



◀ A*STAR and Vietnam's NIC inked a MoU on innovation collaboration in advanced manufacturing

Boosting Competitiveness of Local Precision Engineering

A*STAR and Singapore Precision Engineering and Technology Association (SPETA) have partnered to synergise and share resources across networks, enabling local companies to serve as key suppliers to global enterprises. Companies in A*STAR's network can access SPETA's supplier development activities to boost their supply chain positions and competitiveness. The collaboration will also include technology scan events and updates on sustainability technologies and regulations, aiding the shift towards sustainable manufacturing.

► A*STAR and SPETA sign MoU to enhance the competitiveness of local precision engineering companies





Acquiring Robotics Capabilities through Academic Partnerships

Without in-house R&D capabilities, many SMEs struggle to innovate in robotics and automation. <u>A*STAR's new</u> <u>MoUs with NP and SP</u> empower polytechnic students to develop operation and technology roadmaps for local enterprises. Under the expanded Technology for Enterprise Capability Upgrading (T-Up) programme, SMEs can now enhance their AI capabilities through the secondment of AISG's experts. These initiatives aim to help SMEs innovate, improve business processes and scale up both locally and internationally.

A*STAR signs new MoUs with NP and SP to build a robust talent pipeline that meets the needs of the evolving business environment

Solving Business Challenges with the GET-Up Programme

A*STAR's <u>Growing Enterprises through</u> <u>Technology Upgrade (GET-Up) programme</u> has been a valuable resource for Singaporebased firms to access human capital, shared resources and technology capabilities. Among the firms that have benefitted is Cosmos Innovation, which has since transitioned from developing its AI process optimisation platform for solar cells to focusing on next-generation solar cells. Abrasive Engineering, a Singapore-based surface treatment equipment manufacturer, also worked with A*STAR to streamline product development, reduce time to market, establish credibility and access funding for R&D.

"The journey ahead will require building an extensive set of new capabilities, and we are excited to continue partnering with the GET-Up programme and A*STAR's research entities on this journey."

Mr Vijay Chandrasekhar, *Co-founder and Chief Executive Officer*, *Cosmos Innovation*

"Financially, the program resulted in the generation of intellectual properties and a remarkable US\$2.2 million increase in revenue within four years."

Mr Tan Ser Hean, *Managing Director, Abrasive Engineering*

Optimising Data Centre Cooling with AI

To further reduce energy usage and operate cooling systems for data centre more sustainably in the long term, KoolLogix has partnered with A*STAR to grow its AI capabilities and make smarter cooling systems. This collaboration follows the co-development of a proprietary cooling system, which helping data centre operators save an average of 50% on energy costs. This ongoing partnership will build the SME's workforce competencies in AI.



▲ A*STAR and Singapore-based startup KoolLogix developed a proprietary cooling system that saves an average of 50% on energy costs. Image credit: KoolLogix

Future-Proofing Coffee with Bean-Free Alternative



▲ Prefer upcycles food waste products found locally into sustainable coffee. Image credit: Prefer

Project Carrier is a deep tech venture building programme that supports pre-spinoffs in incubation and market entry. Prefer, the first A*STAR spin-off to emerge from the Carrier programme, developed a proprietary process for a sustainable, bean-free alternative using upcycled local food waste: soya pulp, day-old bread and spent grains. With the <u>secured seed funding</u>, Prefer plans to expand its production capacity to distribute its ground coffee and ready-to-drink beverages across Asia-Pacific, with a focus on Singapore and the Philippines as launch markets.

"Through Prefer, we want to further its conventional use by leveraging cutting-edge science to create a line of sustainable flavours accessible to everyone while conserving the environment."

Mr Tan Ding Jie, Co-founder and Chief Technical Officer, Prefer

Scaling Up Production of Cultivated Meat

A*STAR spin-off Meatiply, a Singapore-based cultivated meat startup, raised fresh funds which will be invested in expanding its R&D capabilities and scaling up production for product co-development with commercial partners. These milestones pave the way for an accelerated commercial launch and position Meatiply to enter the nutraceutical and wellness market.

► The cultivated smoked duck breast, a first for Asia, incorporates both mature fat and muscle cells. Image credit: Meatiply

Transforming Early Detection of Gastric Cancer

A*STAR spin-off MiRXES' flagship product, GASTROClearTM, received the US FDA's Breakthrough Device Designation. Set for expansion to the US market, the first miRNA blood test for early gastric cancer detection enables intervention before symptoms appear. It is co-developed by A*STAR, Diagnostics Development Hub (DxD Hub), the Singapore Gastric Cancer Consortium (SGCC), NUS, National University Hospital (NUH) and TTSH.

▼ A*STAR spin-off MiRXES makes inroads for its flagship product in its global expansion



Supporting Innovation on Novel Cancer and Arthritis Pathway

A*STAR spin-off Albatroz Therapeutics secured funding to accelerate the development of <u>therapeutic antibodies</u> <u>targeting a novel pathway</u>. The pre-clinical stage biotech also received the first Amgen Golden Ticket in Singapore, underscoring the potential of their innovative science and business plan. With these funds, Albatroz aims to advance therapies that reduce tumour and arthritis-related tissue damage, thereby improving treatment outcomes. "The therapeutic antibodies that Albatroz has developed may prevent the growth and metastasis of these cancers. These first-in-class agents have enormous potential to improve our ability to treat patients with cancer."

Professor David Virshup, *Director of the Programme in Cancer and Stem Cell Biology (CSCB) and Professor, Duke-NUS Medical School*

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Disrupting Robot Programming with No-Code Alternative

Conventional robot programming is fragmented and requires highlevel expertise, with software and programming accounting for 75% of the robot's lifetime costs. A*STAR spin-off Augmentus disrupts the market with a <u>no-code alternative</u> to robotics software[®], simplifying programming from weeks to minutes. Augmentus recently secured S\$6.75 million (US\$5 million) funding to scale operations in the US, Europe and Asia, while intensifying their research.



▲ Augmentus No-Code Robotics System for Sandblasting at a customer site. Image credit: Augmentus



INNOVATING FOR NATIONAL PRIORITIES

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



ADDRESSING NATIONAL CHALLENGES

Securing Against Online Threats

The rise of deepfakes and online misinformation poses significant threats to trust and safety in Singapore's digital space. Hosted by A*STAR, the Centre for Advanced Technologies in Online Safety (CATOS) is a national initiative aimed at identifying social vulnerabilities and developing detection tools. These efforts will enhance Singapore's capabilities in online safety, providing tools for content authentication.

Safety Forum | 15 May 2

me Introdu

 Dr Yang Yinping, Director, CATOS speaking at the launch event

for Advanced Technologies in vestigator, Online Trust and Second

Scientist, A*STAR Institute of

TH, ENHANCING LIVES

Enabling Preventive Care using Healthy365 Data



▲ Healthy365 app helps users track their daily steps count and time spent on active exercises. Image credit: Healthy365

Analysing the multimodal data from Health Promotion Board's (HPB) Healthy365 platform, A*STAR is developing AI models to assess the risk for mental health issues, prefrailty and functional health decline. The deployment will support Singapore's transition into preventive healthcare.

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Developing Language Model for Southeast Asian Context

As part of the National Multimodal Large Language Model (LLM) Programme, A*STAR is collaborating with the Infocomm Media Development Authority (IMDA) and Al Singapore (AISG) to develop a <u>speech-text LLM tailored</u> to the Southeast Asian context and nuances[®], drawing on A*STAR's expertise in speech and language research of Southeast Asian languages. Underscoring Singapore's commitment to becoming a global Al hub, this partnership fosters Singapore's Al talent pipeline.



"By investing in talent and investing in large language AI models for regional languages, we want to foster industry collaboration across borders and drive the next wave of AI innovation in Southeast Asia."

Dr Ong Chen Hui, Assistant Chief Executive (Biztech Group), IMDA

ADDRESSING NATIONAL CHALLENGES

Streamlining Material Discovery with AI

A*STAR has been awarded funding from AISG for the <u>"AI for Materials</u> <u>Discovery Grand Challenge</u>". The team is developing a generative AI framework that accelerates the design of advanced materials that are 50% lighter while retaining functional properties. Using open-source datasets and in-house data, this framework will accelerate the development of novel materials, potentially transforming industries like aerospace, transport, and green buildings by creating materials that meet diverse design criteria and functional needs.



A*STAR's Centre for Frontier AI Research (CFAR) team with Mr Heng Chee How, Senior Minister of State for Defence

Shaping Singapore's Future with Ethical AI



▲ Founding members of the AI Alliance, which brings together leading organisations across industry, startup, academia, research and government

A*STAR joined the global <u>Al Alliance</u> as a founding member alongside leaders across academia, research, science, and industry to advance open, innovative, and responsible AI. This alliance will develop benchmarks, tools, and resources for responsible Al deployment, support global AI skills building, and advocate for precision regulation. As the sole Singapore-based member, A*STAR is instrumental in enhancing AI innovations to serve national needs and create impactful applications that benefit Singapore and Singaporeans.

Building a Competitive Robotics Workforce

To harmonise learning outcomes for robotics students, A*STAR signed a MoU with Institutes of Higher Learning (IHLs). The objective is to prepare students for the workforce by equipping them with baseline competencies in Robot Operating System (ROS) framework. The IHLs involved are Nanyang Technological University (NTU), National University of Singapore (NUS), Ngee Ann Polytechnic (NP), Republic Polytechnic (RP), Singapore Polytechnic (SP), Singapore Institute of Technology (SIT) and Singapore University of Technology and Design (SUTD).



Streamlining Translational Research for Better Patient Care



SingHealth and A*STAR have established an S\$8 million <u>Healthcare Translation</u> <u>Partnership (HTP)</u> to co-develop healthcare innovations and translate research from bench to bedside. This represents a significant development in streamlining the translation, deployment and commercialisation of healthcare research and innovation in areas such as Medical Technology; Data Science, AI and Digital Health; and Health Services Innovation. As part of this partnership, A*STAR is developing an imaging system, Terahertz High-Definition Eye Analysis (THEA), to improve diagnosis of eye diseases and make procedures more effective.

 Duke-NUS Medical School, SingHealth and A*STAR representatives at the signing ceremony of the HTP

Translating Biomedical Innovations from Bench to Bedside

To keep up with the accelerating pace of medical innovations, A*STAR, NTU and National Health Group (NHG) partnered to <u>launch Singapore's first biomedical</u> <u>technology incubator</u> collab Novena. This initiative aims to advance healthcare innovations by bridging the gap between ground-breaking research and successful commercial ventures. Collab is closely aligned with A*STAR's purpose to accelerate the development and deployment of novel biomedical technology through spin-offs and technology licensing.

"The best research cannot change patients' lives if there is no product or service. We need successful companies to develop, validate, manufacture and sell such products, before they can enter the clinic. co11ab supports this process by giving early-stage companies direct access to platforms, expertise and resources to do this better and faster."

Professor Benjamin Seet, *Deputy Group Chief Executive Officer (Education and Research), NHG*



▲ A*STAR, NTU and NHG representatives at the official opening of co11ab Novena

Preventing Early Heart Disease in Asymptomatic Singaporeans

Heart disease is a leading cause of death in Singapore, with one in three Singaporeans potentially having undetected early heart disease. To address this, Project RESET, a nationwide preventive healthcare programme, was launched to empower Singaporeans to take charge of their heart health through the roll out of new technologies. A*STAR, National University Health System (NUHS), National Heart Centre Singapore (NHCS), other public healthcare clusters, medical schools, industry, and community partners, will collaborate and leverage artificial intelligence (AI) to develop effective preventive strategies, making heart health more accessible and relevant to individuals.

▼ A*STAR and partners at the official launch of Project RESET



Driving Scalable HealthTech Innovation



▲ A*STAR and Synapxe sign MoU to drive collaboration and scalable innovation in HealthTech for Singapore's healthcare ecosystem

To enhance Singapore's healthcare system, A*STAR and Synapxe signed a Memorandum of Understanding (MoU) to accelerate the development of impactful healthcare solutions. Leveraging A*STAR's scientific expertise in digital health, artificial intelligence, and privacy-enhancing technologies, this collaboration aims to identify and develop emerging technologies, facilitating the translation of these solutions to public healthcare institutions, thereby benefiting patients and supporting healthcare workers.

Restoring Movement in Paralysed Patients

A*STAR partnered with the National Neuroscience Institute and Tan Tock Seng Hospital (TTSH) on the Restoration of Rehabilitative Function with Epidural Spinal Stimulation (RESTORES) trial. This study investigates the efficacy of an <u>implanted spinal cord simulator designed to restore nerve</u> <u>pathways</u> disrupted by spinal cord injury. The first trial showed improved nerve and muscle control, with participants regaining independent walking after robotic rehabilitation.

Spurring High-Value MedTech Productisation in Singapore



▲ This national initiative focuses on life-science tools and medical devices to translate research into commercial products

MedTech Catapult, a S\$38 million national initiative hosted by A*STAR, focuses on accelerating the productisation of life science tools and medical devices. The platform aims to expedite the speed to market of high-value medtech products through design, development, verification, and validation. MedTech Catapult strengthens Singapore's medtech ecosystem by working closely with local contract manufacturers, researchers, clinicians, and regulators.

Advancing MedTech Research and Development

To explore the <u>development of new medical devices and application technologies</u>, A*STAR and GE Healthcare signed a MoU, enabling parties to tap into each other's expertise for research and development (R&D), manufacturing, education and knowledge exchange. A*STAR's expertise in material science, optics, and electronics will advance this multi-disciplinary collaboration, contributing to innovative advancements in medical technology.



A*STAR and GE Healthcare sign MoU for the development of new medical technologies for patient diagnosis and monitoring

Reducing Type 2 Diabetes Risk in Mothers

A*STAR, in collaboration with NUS and the Singapore-ETH Centre, is conducting a four-year study to reduce Type 2 diabetes risk in women who had gestational diabetes. The study will evaluate a digital intervention focusing on diet, activity, sleep, and mental well-being. Participants will use an app to track health data and receive tips from HPB and HealthHub.



Shielding Singapore from Infectious Diseases

To advance local research in infectious diseases, A*STAR has partnered with NHG, NTU Singapore's Lee Kong Chian School of Medicine (LKCMedicine) and National Centre for Infectious Diseases (NCID) to launch the <u>Tripartite Programme in Infectious Diseases for New Discoveries and Treatment (TRIDENT)</u>. The joint programme focuses on three priority disease areas: antimicrobial resistance (AMR), respiratory tract infections and emerging infectious diseases. TRIDENT aims to foster collaboration, establish a centre of excellence, enhance grant competitiveness and drive translational research.

"This collaborative endeavour will enhance our understanding of the biological underpinnings of these disease areas and open innovative avenues for novel therapeutics. In doing so, TRIDENT will facilitate Singapore's resilience against future global infectious disease outbreaks."

Professor Lisa Ng, Executive Director, A*STAR Biomedical Research Council (BMRC) and A*STAR Infectious Diseases Labs (A*STAR ID Labs)



Combatting RNA Viruses through Gene Editing Technology



▲ CRISPR-Cas13 technology targets any form of RNA, including EV-A71, the virus that causes HFMD

A*STAR and NUS Medicine have uncovered the viability of gene-editing technology, CRISPR-Cas13, to treat hand, foot and mouth disease (HFMD). By targeting and destroying specific ribonucleic acid (RNA) sequences of the virus, this technique provides faster relief and lasting results. The success opens the door to treatments for a wider range of RNA viruses such as influenza, dengue, COVID-19 and Ebola.

Defending against Nipah Virus with circRNA Vaccine



▲ The collaboration aims to enable the development and manufacturing of more accessible RNA vaccines. Image credit: Hilleman Laboratories

A*STAR and Hilleman Laboratories have partnered to <u>develop a</u> <u>Nipah virus vaccine with novel circular ribonucleic acid (circRNA)</u> <u>technology</u>, addressing the current lack of a vaccine for the virus. This collaboration leverages A*STAR's expertise in mRNA and delivery that targets immune cells to enhance the development and manufacturing of circRNA vaccines. The collaborative effort focuses on designing and testing different circRNA constructs to validate the technology as a vaccine precursor. Success in this endeavour could pave the way for the development of accessible RNA vaccines for other infectious diseases with epidemic and pandemic potential in Singapore and the region.

"We believe the collaboration with A*STAR will bring us closer towards establishing circRNA as a vaccine platform to meet urgent global public health needs and address issues such as thermostability."

Mr Raman Rao, Chief Executive Officer, Hilleman Laboratories

Accelerating Clinical Delivery of Immunotherapies

A*STAR and SCG Cell Therapy have launched joint laboratories to produce novel cell therapies that meet Good Manufacturing Practice (GMP) standards, accelerating the delivery of innovative immunotherapies to clinics. A*STAR brings its unique monoclonal antibody assets, iPSC banks, and expertise in process scaling and analytics to the partnership, which aims to leverage expertise and resources from private and public entities to co-develop novel cellular immunotherapies and build capabilities within the field.



▲ From left: Mr Frank Wang, Chief Executive Officer, SCG Cell Therapy; Professor Tan Sze Wee, Assistant Chief Executive, BMRC, A*STAR; Professor Koh Boon Tong, Executive Director, Bioprocessing Technology Institute (BTI), A*STAR

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Delivering Immunotherapies for Hard-to-Treat Cancers



Acute Myeloid Leukaemia (AML) and breast cancer have high incidence rates and limited treatment options. A*STAR spin-off CytoMed Therapeutics is collaborating with the University of Texas' MD Anderson Cancer Center to <u>develop</u> <u>novel treatment modalities</u>, such as the use of CytoMed's licensed allogenic gamma-delta T cell (gdTc) for various subtypes of AML and breast cancer.

Leading the Way in AI-Driven Healthcare



▲ Signatories at the A*STAR-EVYD Joint Lab signing ceremony

A*STAR established a joint lab[®] with EVYD Technology to advance AI for population and digital health. Tapping on A*STAR's expertise in secure data technologies, this initiative focuses on streamlining diagnostic workflows, remote health monitoring, and using LLM for health services. By enabling secure, multi-institutional collaborations, the lab aims to address various healthcare challenges, enhance patient outcomes, and foster innovative healthcare solutions.

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Uncovering Tuberculosis Severity Link in Type 2 Diabetes

A study by A*STAR and University of Massachusetts Chan Medical School found that high blood glycerol levels worsen tuberculosis in patients with Type 2 diabetes. Blocking the bacteria's ability to metabolise glycerol reduced lung damage severity. This discovery sheds light on the <u>interaction</u> <u>between the two diseases</u> and paves the way for novel treatment approaches.

Improving Wound Care with AI Sensor Patch

Diagnosing wound infections typically requires clinicians to remove wound dressing regularly to inspect the site, increasing the risk for infection. A*STAR collaborated with NUS and NTU to develop a <u>paperthin sensor patch</u> that indicates the wound's healing status. This innovation allows clinicians to monitor wounds and administer timely treatments, while reducing the need for dressing changes.



▲ The Paper-like Battery-free In situ Al-enabled Multiplexed (Petal) sensor patch is about the size of a postage stamp

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Improving Patient Outcomes with Data Informatics Repository

A*STAR and BC Platforms launched a joint lab to enhance secure biomedical data informatics, driving the development of innovative solutions for better patient outcomes. This collaboration advances healthcare by combining technical resources with A*STAR's R&D capabilities to enable clinical research, trials and precision medicine.

Signatories at the A*STAR–BC Platforms Joint Lab MoU signing ceremony

Enhancing Overall Health and Brain Function

More than one in four in Singapore will experience a neurological condition in their lifetime, and often time lack effective treatments. Bridging the gap in current treatment options, A*STAR and Cerecin Inc. signed a MoU to <u>study fundamental causes of neurological</u> <u>diseases</u> and develop innovative treatments.

"This partnership represents a further step in our commitment to driving advances in neurometabolism and underscores our dedication to providing cutting-edge solutions. Singapore has a rapidly ageing population. As age is the leading risk factor for many neurodegenerative diseases, we are proud to form one of the first public-private collaborations in brain health."

Dr Charles Stacey, Chief Executive Officer and President, Cerecin

A*STAR and Cerecin sign MoU to advance R&D in neurological disorders



BUILDING COLLABORATIONS FOR BETTER SOCIETAL OUTCOMES

Improving Mother Tongue Proficiency with Personalised AI Feedback



The use of Mandarin, Malay and Tamil at home by younger generations has seen a decline. Further, variations in students' linguistic development make it challenging for educators to provide individualised feedback, especially in large classes. To overcome this challenge, A*STAR developed an Al-powered Multilingual, Multimodal <u>Al Tutor</u> for personalised feedback on speaking skills. This home-based AI tutor uses images to support conversations and assess picture conversation skills in oral examinations. It can also evaluate student engagement through voice analysis, helping teachers adapt their methods to keep students engaged.

SingaKids Pic2Speak Multilingual AI Tutor Team

Uncovering Mental Health Risks in Children Exposed to Prenatal Adversity

Using MRI brain scans from the Growing Up in Singapore Towards healthy Outcomes (GUSTO) cohort, A*STAR found that children exposed to high levels of adversity in the womb show accelerated pattern of brain development, which increases the risk of cognitive impairment and mental health disorders. The study also revealed that early interventions between the ages of 4.5 and 6 years can lead to healthier cognitive outcomes. This research paves the way for future studies on whether early life stressors cause accelerated brain ageing.





Assessing Academic Preparedness of Pre-Schoolers

Children at risk for developmental delays are typically identified when they enter primary school, resulting in missed opportunities for early intervention. A*STAR and NUS Medicine developed a <u>school-readiness tool</u> to evaluate competencies in general knowledge, literacy, numeracy and executive function in children aged four to six. This assessment enables teachers to personalise their curriculum to match their pupils' capabilities and has been rolled out at 18 PAP Community Foundation (PCF) pre-schools, benefiting more than 500 students.

Minimising Health and Economic Burdens of Chronic Wounds

Treatment for chronic wounds impacts both patients and the healthcare system. A*STAR and Duke-NUS conducted the first local study to **quantify the national cost of chronic wounds** in a multi-ethnic Asian population, highlighting the potential for cost reduction and improved patient outcomes through preventative measures and wound management.

SHAPING A SUSTAINABLE FUTURE

Tackling Energy Transition and Other Sustainability Challenges

The transition to net zero emissions brings significant technological and sustainability challenges to overcome. The need for a robust collaboration between industry and academia has driven the <u>launch of Singapore's first Corporate Lab</u>[®] for the advancement of low-carbon research capabilities. In partnership with NTU and ExxonMobil Technology and Engineering Company (ExxonMobil), A*STAR will advance research to accelerate technological deployments in support of the energy transition.

"The Corporate Lab is a first in Singapore launched with a global energy player. The joint lab is a valuable addition to our ecosystem that will spur solutions for a greener future, while developing homegrown talent in R&D and sustainability here."

Mr Lim Wey-Len, Executive Vice President, Singapore Economic Development Board

EXXONMOBIL-NTU-A*STAR

CORPORATE LAB

 ExxonMobil, NTU Singapore and A*STAR established the S\$60 million corporate lab for low carbon solutions

UNIVERSITY EXCONMODIL

Creating a Circular Economy for Electric Vehicle Batteries

The electrification of transportation has heightened the need for effective solutions to address issues such as the piling up of retired Electric Vehicle (EV) batteries and the growing demand for raw materials to manufacture batteries. A*STAR launched an EV Battery Testing and Disassembly Line as part of a wider effort to utilise Industry 4.0 technologies for safe, efficient and sustainable EV battery management.



▲ Pack Inspection and Disassembly station of the EV Battery Testing and Disassembly Line at A*STAR's Advanced Remanufacturing and Technology Centre (ARTC)

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Developing Low-Carbon Energy Solutions

In line with Singapore's National Hydrogen Strategy, A*STAR signed a MoU with Vopak Terminals Singapore to <u>explore generating</u> <u>electricity using hydrogen and</u> <u>ammonia</u>. Drawing on A*STAR's research capabilities in energy transition and low-carbon energy, this partnership aims to address challenges such as scalability, safety, storage and transportation, paving the way for researchers to conduct technology pilots and accelerate R&D.



▲ The signatories of the MoU were Mr Rob Boudestijn (right), President, Vopak Terminals Singapore, and Professor Yeo Yee Chia, Assistant Chief Executive, Innovation & Enterprise, A*STAR

SHAPING A SUSTAINABLE FUTURE

Reducing Waste Generated from Aircraft Maintenance

A*STAR <u>developed repair process</u> methodologies[®] designed to recoat surfacedamaged copper trims, reducing waste generated by Singapore Airlines (SIA) and SIA Engineering Company (SIAEC) during repair work. Laboratory test results have revealed that repaired trims are 50% more durable than conventional trims. This significantly reduced the lead time for replacement, resulting in a more sustainable maintenance process.



▲ A*STAR and local SME, Applied Total Control Treatment Pte Ltd, collaborate to refurbish SIA cabin components

Repurposing Waste and Carbon Dioxide to Manufacture Concrete



▲ Natural sand (left) and alternative sand created by combining captured carbon dioxide with incineration bottom ash

A joint effort by A*STAR, NUS and NTU has pioneered an <u>alternative sand from</u> incineration ash and captured carbon dioxide (CO₂)[•]. This innovation tackles the challenge of low-concentration CO₂ captured through A*STAR's specially formulated liquid that significantly intensifies CO₂ concentration. This CO₂ is then captured on the surface of incineration ash, forming a carbonate compound with the potential to replace natural sand in construction applications.

Uplifting Capabilities in Sustainable Food Production

Nurasa's Food Tech Innovation Centre (FTIC) serves as a strategic hub for <u>developing and commercialising sustainable food solutions</u> <u>across Asia</u>. A*STAR operates two joint laboratories within the FTIC, specialising in fermentation and food processing. These public-private partnerships with Nurasa and ScaleUp Bio empower companies to scale innovations and pioneer breakthroughs, bolstering food security and sustainability efforts in the region.



CONTRIBUTING TO A STRONGER ECOSYSTEM

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A*STAR innovates for futurereadiness through our national platforms, addressing priorities in healthcare, robotics, quantum and maritime technology. Our top talents foster a vibrant scientific community, as part of the talent pipeline for Singapore's RIE ecosystem.



National platforms function as strategic resources to accelerate research, development, and innovation across specific sectors. By consolidating expertise from public agencies, academia, and industry, they address national priorities and drive economic growth. A*STAR hosts national platforms in biomedical sciences, energy, advanced manufacturing, metrology, quantum technology, robotics, semiconductors, supercomputing, maritime technology, and urban solutions and sustainability.

Promoting Innovation and Adoption of Robotics

The National Robotics Programme (NRP) launched the RoboCluster initiative to foster collaboration among A*STAR researchers, IHLs, end-users and robotics companies. These partnerships boost the adoption of robotics across various sectors. Through a collaboration with local company LionsBot, the RoboCluster initiative will be rolled out in the facilities management sector, and will soon extend to healthcare, logistics and other sectors.

"The (RoboCluster) initiative is aimed to catalyse and foster stronger collaboration, and to translate R&D into enterprise. Many small and medium-sized enterprises may be interested in robotics, but they may not know how to adopt them, so that is something we need to discuss."

Mr Alvin Tan, Minister of State for Trade and Industry



▲ Launch of the "RoboCluster for Facilities Management" initiative at LionsBot's new robotics facility at Kranji

Unlocking Sustainability and Supply Chain Resilience with Additive Manufacturing

The National Additive Manufacturing Innovation Cluster (NAMIC) signed a MoU with the Land Transport Authority (LTA) and Alstom to collaborate on additive manufacturing (AM) in the rail industry. The Joint Industry Programme allows companies to adopt on-demand additive manufactured train parts and digital spare inventory, reducing vulnerability to supply chain disruptions. Sustainable or recycled materials can also be used, enabling companies to meet the sustainability expectations of investors and consumers.

▼ NAMIC, LTA and Alstom sign MoU for the Additive Manufacturing Joint Industry Programme



Fostering International Collaborations in Deep Tech and Additive Manufacturing

NAMIC signed a MoU with Valuence Ventures to <u>build the deep tech and AM ecosystem</u> across Singapore, South Korea and North America. The alliance will accelerate the growth of Singapore's startups in the cleantech and biotech sectors. Valuence Ventures' portfolio companies will introduce innovative technology and talent into Singapore.

"This partnership will not only enhance our ecosystem's access to international markets, but also contribute to establishing Singapore as a global leader in digital manufacturing, sustainability and precision medicine."

Dr Ho Chaw Sing, Chief Executive Officer, NAMIC



▲ NAMIC and Valuence Ventures sign a MoU to connect deep tech innovation ecosystems in Singapore, South Korea and North America

Cultivating Singapore's Quantum Ecosystem



▲ The signatories of the MoU were Mr Vincent Kwa (left), Sales Director, ASEAN, Tektronix Country and Dr Alexander Ling, Director, QEP and Associate Professor, NUS

The Quantum Engineering Programme (QEP) and Tektronix, Inc. signed a MoU to <u>collaborate on developing quantum technologies</u> within the National Quantum Fabless Foundry (NQFF). This partnership taps on the expertise of industry players to build critical capabilities, addressing Singapore's strategic needs in quantum technology.



Kickstarting Careers of Quantum Computing Students

To support the development and adoption of quantum computing in Singapore, the National Quantum Computing Hub (NQCH) partnered with SoftServe and the IMDA to host Quantum Bootcamp 2023. Bridging academia and industry, the 8-week bootcamp includes hands-on activities and networking opportunities with top multinational companies to help young talents launch their careers

▲ Quantum Bootcamp 2023. Image credit: Centre for Quantum Technologies

Decarbonising Shipping with Methanol Bunkering

In partnership with the Maritime and Port Authority (MPA), the Technology Centre for Offshore and Marine, Singapore (TCOMS) and A*STAR conducted the world's first ship-to-containership methanol bunking operation⁴. This success demonstrates the potential of green methanol as a cleaner alternative fuel. As the world's top bunkering port, Singapore achieved a significant milestone in decarbonising the shipping industry.

The world's first container ship powered by green methanol was refuelled with approximately 300 metric tonnes of bio-methanol



Establishing Assurance Protocols for the Maritime Industry

TCOMS, A*STAR, and the UK-based National Physical Laboratory (NPL) signed a MoU to develop international standards for autonomous maritime systems. The initiative will create guidelines for the international adoption of Maritime Autonomous Surface Ships (MASS). Leveraging Singapore's maritime R&D strengths, the cross-border collaboration positions Singapore as a leader in maritime innovation and supports the reliability and safety of autonomous maritime systems worldwide.

▼ TCOMS, A*STAR and NPL partner to advance the development of international maritime autonomy assurance and standards for autonomous maritime systems



Accelerating Growth in Offshore Renewable Energy

TCOMS and Seatrium Limited will establish the <u>Seatrium-TCOMS Ocean Lab</u>[®] to advance smart ocean systems and infrastructure under a master research collaboration. Focusing on five thrusts – renewable energy, cleaner oil and gas solutions, smart marine systems, new energy solutions and digitalisation and data analytics – the partnership aims to develop sustainable maritime solutions. This supports Singapore's low-carbon transition and captures global opportunities in the green economy.



Signing of Master Research Collaboration Agreement to establish Seatrium-TCOMS Ocean Lab

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Supporting the Development of Nucleic Acid Therapeutics

To position Singapore as a regional hub for nucleic acid therapeutics (NAT) research, A*STAR launched the <u>Nucleic Acid Therapeutics Initiative (NATi)</u>. Through a twopronged approach, the NAT Exchange platform fosters the development of novel RNA formulations, while the RNA Foundry advances manufacturing technologies and processes. The new national platform leverages Singapore's growing capabilities in RNA research and supports local SMEs and startups.
OUR NATIONAL PLATFORMS

Utilising AI to Accelerate Drug Discovery

EDDC signed a new MoU with XtalPi to expand their collaboration in accelerating drug discovery for non-small cell lung cancer using AI and automation. The new focus includes using <u>automated synthesis solutions</u> and LLM[®] to drive biopharmaceutical innovation. The partnership aims to advance the translation of research into robust pipeline assets, delivering novel therapies to patients worldwide.

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Targeting Cancer with Novel Immunotherapies

The Experimental Drug Development Centre (EDDC) and A*STAR spin-off ImmunoScape have partnered to <u>overcome current limitations in cell therapy</u> <u>approaches</u> against solid tumours. This partnership aims to develop therapies that activate the patient's T cells to target and eliminate cancer cells, offering new hope for cancer treatment.



Evaluating Novel Treatment for Metastatic Solid Tumours

EDDC, in collaboration with A*STAR, and the National Cancer Centre Singapore (NCCS), has developed an antibody-drug conjugate (ADC) that selectively targets cancer cells. This <u>treatment</u> approach has since entered clinical development[®] and is currently in Phase 1 trial to assess the safety and tolerability of EBC-129. The ADC has also been cleared for entry into first-in-human studies by the U.S. Food and Drug Administration (FDA).

"We will continue to work closely with all investigators to progress this study and bring us collectively closer to our goal of providing an effective treatment option for patients who have exhausted standard therapies."

Professor Damian O'Connell, Chief Executive Officer, EDDC

▼ *Representatives from the multi-institutional teams involved in the development of EBC-129 and its patient selection test*



The President's Science and Technology Medal 2023

Awarded to individuals who have made distinguished, sustained and exceptional contributions, and played a strategic role in advancing Singapore's development through promotion and management of science and technology (S&T).

Mr Quek Gim Pew, A*STAR Board Member, was awarded in recognition for his pivotal role in developing Singapore's research ecosystem in critical areas including defence capabilities, space technology, advancing quantum engineering, artificial intelligence and high-performance computing.



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MTI Firefly Awards

The Firefly Awards celebrate the best of ideas and recognise individuals within the MTI Family who have exemplified strengths in the respective award categories.



Innovative Project / Policy Gold Award

Harnessing Green Energy through Innovative Bi-Directional Tidal Turbine Design led by A*STAR's IHPC The project maximises sustainable energy by capturing ebb and flood tides. It reimagines tidal turbine design and supports green energy transitions, fostering a decarbonised future and unlocking untapped market potential.

Innovative Project / Policy Bronze Award

Innovation Factory @ SIMTech drives a culture of product innovation among local companies and accelerates product development with the Ideation-Design-Engineering-Application Framework.

Exemplary Firefly Award (Silver)

Dr Sebastian Maurer-Stroh, *Executive Director*, *Bll*, with his expertise in bioinformatics and computational biology, has catalysed impactful applications in infectious diseases and allergy prediction, reshaping global scientific, public health, and regulatory landscapes. He fosters collaboration and shared aspirations through unifying diverse groups.

Honorary Citizen Award (HCA)



The title of Honorary Citizen is a national award conferred by the Singapore Government since 2003 to recognise and acknowledge the contributions of non-Singaporeans who have rendered extensive and valuable services to Singapore and its people, or who have made a significant impact in the areas of business, science and technology, information communications, education, health, arts and culture, sports, tourism and community services or security.

Professor William Chin. A*STAR *Board Member,* has been a member of the A*STAR Board since 2011. where he has been instrumental in advising A*STAR and Singapore's Research, Innovation and Enterprise (RIE) ecosystem on health and biomedical sciences initiatives. He has made distinguished contributions to biotherapeutics research in Singapore and played a catalytic role in the creation of the national platform, EDDC. Prof Chin also participated in and driven a range of collaborative projects with various stakeholders in the biomedical research ecosystem, including universities, medical institutes and biotechnology companies, nurturing many local scientists in the process.





National Research Foundation (NRF) Fellowship 2024

The NRF Fellowship provides support for outstanding early career researchers from all over the world to lead impactful research in Singapore.



Dr Kenneth Lay, Senior Scientist, A*SRL, was awarded for the research titled "Going Skin-Deep: Targeting Stem Cells to Tackle Inflammatory Skin Diseases".



Dr Tan Yong Kiam, Senior *Scientist, I*²*R*, was awarded for the research titled "Verifying the Verifiers: Trustworthy **Proofs for Critical Computer** Systems".



Dr Leslie Beh, Principal Scientist, *IMCB*, was awarded for the research titled "Mechanistic studies and applications of RNA modifications using 'designer' RNA".



Dr Timothy Stuart, Principal Scientist, GIS, was awarded for the research titled "Design of synthetic DNA regulatory elements for precision gene therapy".



Dr Leow Wan Ru, Senior *Scientist, ISCE*², was awarded for the research titled "Photoelectrocatalytic:mediator strategies towards emissionsfree e-refining of chemicals".

National Research Foundation (NRF) Investigatorship 2024

The NRF Investigatorship is awarded to mid-career scientists who have a track record of research achievements that identify them as leaders in their respective fields of research.



Dr Li Qi-Jing, Senior Principal Scientist, *IMCB*, was awarded for the research titled "Harnessing distant resident memory T cells to prevent breast cancer metastasis".





Dr Niranjan Nagarajan, Senior Principal Scientist, GIS, was awarded for the research titled "Understanding and remodeling microbial communities to prevent the spread of antimicrobial resistant pathogens".

Dr Seh Zhi Wei, Principal Scientist, *IMRE*, was awarded for the research titled "Universal Design Principles for Multivalent-Ion Batteries".



Public Sector Transformation Awards



One Public Service Award

This award recognises agencies for exemplary inter-agency initiatives that have reflected a sustained and institutionalised approach to collaboration.

National Effort to Electrify Singapore's Vehicle Population

A*STAR with MOT, BCA, EDB, EMA, HDB, LTA, MOF, MND, SCDF, S&TPPO and URA



Regulatory Excellence Award

Service, and are future ready.

This award recognises exemplary initiatives

burden and cost. create value for the Public

that have made reforms that reduce regulatory

Green Economy Regulatory Initiative

A*STAR with MTI, EDB, EMA, EnterpriseSG,

BCA, CAAS, HDB, JTC, LTA, MAS, MOT, MPA,

NEA, PUB, SCDF, SFA, SLA, STB and URA



Exemplary Leader Award

This award recognises exemplary Senior Directors, Directors and Middle Managers who have led and grown their teams to transform and deliver excellent service, as well as driven innovation and change within their teams.

Professor Patrick Tan, *Executive Director*, *GIS*, transformed GIS into Southeast Asia's genomics leader. Charting a 10-year roadmap, he fostered a collaborative research environment recognised across A*STAR. Empowering early-career researchers and attracting global talent, his team achieved breakthroughs in cancer treatment, advancing several clinical trials and setting a gold standard for innovation and excellence.

Defence Technology Prize 2023

The award recognises contributions that have helped the Singapore Armed Forces (SAF) maintain its sharp edge in defence capabilities.

Professor Ng Geok Ing, *Centre Director, NGTC*, has made significant contributions in building up Singapore's R&D capabilities in Gallium Nitride (GaN) Monolithic microwave integrated circuit (MMIC) technologies for defence applications.



IES Prestigious Engineering Achievement Award 2023

The award recognises projects that enhance the engineering progress and life quality in Singapore. I²R was awarded for the project titled "Smart Automated Aircraft Visual Inspection System (SAAVIS)".



IES Sustainability Awards 2023



Innovative Project for Sustainability

The award recognises outstanding achievements of engineering projects and initiatives that reduce environmental impact and carbon footprints via new technologies, products, or services that promote sustainability.

ASEAN Outstanding Engineering Achievement Awards 2023

The award recognises organisations or persons responsible for an outstanding engineering project in the ASEAN region.

ISCE² was awarded for the project titled "Accelerated Catalyst Development Platform (ACDP)".

NURTURING TOP TALENT (INTERNATIONAL AND NATIONAL FELLOWSHIPS)

Newly Elevated IEEE 2024 Fellows

The IEEE Fellow is a recognition of remarkable accomplishments that have contributed significantly to the advancement or application of engineering, science, and technology.



Dr Li Xiaoli, Senior Principal Scientist, I²R, was awarded for his contributions to machine learning models.



Dr Yao Kui, *Senior Principal Scientist, IMRE*, was awarded for his contributions to the development of advanced ferroelectric thin films and their sensor applications.



EMBO Global Investigator Network

Over four years, the new Global Investigators will receive financial support for training and networking activities, providing opportunities to build collaborations with scientists in their region and Europe.

Dr Chen Jinmiao, *Principal Scientist*, *SlgN*, was awarded for her research titled "Harnessing AI to analyse single-cell and spatial omics for precision immunology".



Fellow of Academy of Engineering, Singapore (SAEng) 2023

The recognition is bestowed upon individuals based on their stellar leadership and career achievements in the field of engineering across all disciplines.

Dr Sun Sumei, *Executive Director*, *I*²*R*, has authored and coauthored over 300 technical papers in prestigious Institute of Electrical and Electronics Engineers (IEEE) journals and conferences and over 30 patent applications, many of which have been licensed to the industry. Her impact extends beyond research, with leadership roles in the national task force and the IEEE community.

NURTURING TOP TALENT (INTERNATIONAL AND NATIONAL FELLOWSHIPS)

L'Oréal-UNESCO For Women in Science Award Singapore

The global initiative, inaugurated in Singapore in 2009, aids women scientists in advancing their research.



Dr Leow Wan Ru, *Senior Scientist, ISCE*², was awarded for her outstanding work on the use of renewable energy to power chemical reactions.



Dr Yang Le, *Principal Scientist, IMRE*, was awarded for her outstanding work on optoelectronics and flexible sensors.

Fellow of the Royal Society of Chemistry



The recognition is bestowed upon seasoned professionals whose tireless dedication, profound expertise, and continual efforts advance the stature of chemical science.

Dr Seh Zhi Wei, Principal Scientist, IMRE

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Fellow of the American Academy of Microbiology



The recognition is bestowed upon individuals based on their records of scientific achievement and original contributions that have advanced microbiology.

Dr Wang Yue, Senior Principal Scientist, A*STAR ID Labs

NURTURING TOP TALENT (INTERNATIONAL AND NATIONAL FELLOWSHIPS)



Fellow of the Institution of Engineering and Technology

The recognition is bestowed upon individuals who have made significant contributions to the engineering and technology field, recognising their expertise, leadership, and commitment to advancing the profession.

Dr Richard Gao, Senior Principal Scientist, IHPC



Fellow Member of Optica

The distinction is awarded to individuals for their significant contributions to the advancement of optics and photonics through education, research, engineering, business leadership and service.

Dr Luo Xianshu, *Principal Scientist, IME*, was awarded for outstanding contributions to silicon photonic integration technology development and commercialisation.

The Institution of Engineers, Singapore (IES) 49th Honorary Fellow



The conferment recognises distinguished and eminent individuals whose membership enhances the institution's prestige and advances its interests.

Professor Yeoh Lean Weng, *Chief Sustainability Officer, ISCE*², was recognised for his extraordinary contributions to engineering particularly in accelerating sustainable development in Singapore.

Singapore Maritime Institute (SMI) Fellow 2023



The scheme recognises senior researchers for their individual research achievements, and role in fostering the growth and development of the broader maritime R&D community through mentoring young and aspiring researchers.

Dr Fu Xiuju, Senior Principal Scientist, IHPC

IEEE Vehicular Technology Society 2023 -Women's Distinguished Career Award



The award recognises outstanding women engineers who have made significant contributions in the IEEE Vehicular Technology Society fields of interest.

Dr Sun Sumei, *Executive Director*, *I*²*R*, is the 1st in Singapore to be honoured with this award.

MIT Technology Review Innovators Under 35 Asia Pacific



The recognition is bestowed upon top-notch young innovators from various cutting-edge S&T and industry fields annually and accelerates the pace of S&T innovations from around the globe.

Dr Yang Le, *Principal Scientist, IMRE*, was awarded for her outstanding work on ultrahigh efficiency solution-processed OLEDs and small on-skin electronic sensors to noninvasively measure biochemicals.

ASEAN-ROK Award for Excellence in Science, Technology and Innovation



The award recognises the academic and professional achievements of promising, early-career scientists and engineers of ASEAN nationality, aiming to encourage them to actively contribute to research in STI, with a focus on promoting socio-economic development.

Dr Tony Ha, *Senior Scientist, IMRE*, has published more than 40 scientific articles and international patents, with a total citation count exceeding 4,000 and an H-index of 21. His exceptional research has been featured and lauded in top-tier scientific publications, including Nature Nanotechnology, Nature Photonics, and Advanced Materials.

ISEV2023 Special Achievement Award



The ISEV Special Achievement Award is presented each year at the International Society for Extracellular Vesicles annual meeting for outstanding contributions to EV science and/or ISEV.

Dr Lim Sai Kiang, *Senior Principal Scientist, IMCB*, was awarded for her pioneering work on stem cell-derived extracellular vesicles (SC-EVs).

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The Society of Chemical Engineers, Japan (SCEJ) Award 2023



The award recognises individuals who have accomplished outstanding achievements in chemical engineering.

Dr Zhang Lili, *Principal Scientist*, *ISCE*², was recognised for her contribution to sustainable and low-carbon process, clean energy production and waste upcycling.

Emerging Investigators Award by Nanoscale

The award recognises rising stars of nanoscience and nanotechnology by gathering some of the very best work from researchers in the early stages of their independent careers.



Dr Li Zibiao, Senior Principal Scientist, IMRE, was awarded for his research titled "lonogels: recent advances in design, material properties and emerging biomedical applications".



Dr Wu Jing, *Senior Scientist, IMRE,* was awarded for his research titled "Homogeneous in-plane WSe2 P-N junctions for advanced optoelectronic devices".



Dr Zhu Houjuan, *Scientist, IMRE,* was awarded for her research titled "Rare-earthdoped indium oxide nanosphere-based gas sensor for highly sensitive formaldehyde detection at a low temperature".

NURTURING TOP TALENT (MAJOR GRANTS)

National Research Foundation (NRF) White Space Funding

The NRF White Space funding enables Singapore to respond nimbly to new priorities, seed capabilities in critical, but then-nascent technology areas, and address research gaps via new and/or cross domain ideas.

Our scientists were awarded for establishing the National Gallium Nitride Technology Centre (NGTC), which aims to be at the forefront of developing radio frequency and millimetre wave gallium nitride technologies for 5G/6G networks, Internet-of-Things, autonomous vehicles, and smart cities.



Professor Ng Geok Ing, Lead PI and Centre Director, NGTC



Dr Surasit Chung, Senior Principal Scientist, IME



Dr Navab Singh, Senior Principal Scientist, IME

NRF 29th Competitive Research Programme

The NRF Competitive Research Programme (CRP) funding scheme seeks to foster the formation of multidisciplinary teams to conduct cutting-edge research projects relevant to Singapore and society.

Our scientists were awarded for the project titled "Spatial Multiome Cartography in Human Thymus to Guide NextGen Cell-based Therapies (SPECTRA)", in collaboration with NUS and NUHS.



Dr Jonathan Loh, *Lead PI and Deputy Executive Director (Research & Development), IMCB*



Dr Shyam Prabhakar, *Co-investigator and Senior Principal Scientist, GIS*



Dr Li Qi-Jing, Co-investigator and Senior Principal Scientist, IMCB



Dr Chen Jinmiao, Collaborator and Principal Scientist, SIgN



Dr Chen Qingfeng, *Co-investigator and Senior Principal Scientist, IMCB*



Dr Leslie Beh, *Collaborator and Principal Scientist, IMCB*

NURTURING TOP TALENT (MAJOR GRANTS)

NRF 30th Competitive Research Programme

The NRF CRP funding scheme seeks to foster the formation of multi-disciplinary teams to conduct cutting-edge research projects relevant to Singapore and society.

Our scientists were awarded for the project titled "Achieving Coherence in Opto-Mechatronic Levitation Systems for Precision Quantum Sensing", in collaboration with NUS.



Professor Lam Ping Koy, Lead PI and Senior Principal Scientist, IMRE

Dr Dong Zhaogang, Co-investigator and

Dr Wang Tao, Co-investigator and Principal Scientist, IMRE Senior Scientist, IMRE



MTC Young Individual Research Grants

The MTC Young Individual Research Grants (YIRG) support novel and fresh R&D investigator-led ideas, and groom young researchers to conduct independent research.

Dr Valerian Hall-Chen, Senior Scientist, IHPC, was awarded for his project titled "Understanding plasma turbulence in stellarators with the Doppler backscattering diagnostic".

NMRC Open Fund - Individual **Research Grant**

The Open Fund - Individual Research Grant by the National Medical Research Council (NMRC) supports basic, translational and clinical research that is relevant to human health and potential, including those that look at the causes, consequences, diagnosis and treatment of human diseases.

Dr Ng Shi Yan, *Principal Scientist*, *IMCB*, was awarded her project titled "Investigating the relationship between lipid metabolism defects and astrocyte-mediated toxicity in neurodegeneration".



MTC Individual Research Grants

The MTC Individual Research Grants (IRG) aims to support novel and fresh R&D investigator-led ideas.

Dr Ho Pin, Senior Scientist, IMRE, was awarded for her project titled "Energy efficient antiferromagnetic tunnel junction for next generation green computing".



NMRC Open Fund - Young Individual **Research Grant**

The Open Fund - Young Individual Research Grant by the National Medical Research Council (NMRC) supports basic, translational and clinical research that is relevant to human health and potential, and grooms new investigators in independent research.

Dr Desiree Phua, Senior Scientist, SICS, was awarded her project titled "Maximising the effectiveness of public health messaging to improve adolescent mental health in Singapore".

NURTURING TOP TALENT (OTHER AWARDS AND RECOGNITION)

Singapore 100 Women in Tech

The SG100WIT initiative celebrates women who have made significant contributions to tech in Singapore.



Dr Chayaporn Suphavilai *Scientist, GIS*



Dr Dora Hu Principal Scientist, I²R



Ms Nur Atiqah Othman Senior Research Engineer, IHPC



Dr Chen Jinmiao *Principal Scientist, SlgN*



Dr Li Hongying *Principal Scientist, IHPC*



Dr Rosa So Principal Scientist, I²R



Dr Cui Shan Principal Scientist, NMC



Dr Liu Fayao Senior Scientist, I²R



Dr Zhang Mengmi *Principal Scientist, I*²*R*

Tan Yew Oo Distinguished Professorship



Professor Teh Bin Tean, Research Director, GIS; Deputy Chief Executive Officer (Research), NCCS.

The conferment of this award is an endorsement of Prof Teh as an outstanding scientist who has made many novel discoveries in cancer pathology that have impacted its understanding and promoted advances in cancer diagnosis and treatment.

NURTURING TOP TALENT (OTHER AWARDS AND RECOGNITION)

Highly Cited Researchers (HCR) 2023

According to the Clarivate Analytics Web of Science Group, A*STAR's researchers are renowned for their expertise in fields such as immunology, molecular biology and genetics, as well as in cross-disciplinary work. They continue to exemplify our dedication to fostering a multi-disciplinary approach, and strong collaborative and innovation environment.



Dr Chen Jinmiao Principal Scientist, SlgN



Professor Chen Xiaodong Professor, NTU Principal Scientist, IMRE



Dr Gan Renyou Principal Scientist, SIFBI



Dr Lai Ruenn Chai Principal Scientist, IMCB



Professor Laurent Rénia Professor, NTU Senior Fellow, A*STAR ID Labs



Dr Lim Sai Kiang Senior Principal Scientist, IMCB



Professor Lisa Ng Executive Director, A*STAR ID Labs



Professor Liu Xiaogang Professor, NUS Principal Scientist, IMRE



Dr Peter See Senior Scientist, SIgN



Dr Seh Zhi Wei Principal Scientist, IMRE



Dr Subhra Kumar Biswas Principal Investigator, SIgN



Dr Xi Shibo Senior Scientist, ISCE²



Dr Zhang Gang

Senior Principal

Scientist, IHPC



Professor Florent Ginhoux Laboratory Director, Gustav Roussy Principal Investigator, SIgN





NURTURING TOP TALENT (OTHER AWARDS AND RECOGNITION)

World's Top 2% Scientists by Stanford University





Career Long Impact 2022 <u>70 A*STAR staff</u> were recognised on the list

Single Year Impact 2022 109 A*STAR staff were recognised on the list

by Stanford University

Congratulations

to our A*STAR scientists who were recognised on the list!









ADVANCING SCIENTIFIC EXCELLENCE

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A*STAR champions use-inspired basic research and its translation to fuel Singapore's innovation pipeline and address global challenges.



Formulating Rules for Developing More Effective Drugs

A*STAR scientists, along with researchers from Singapore, Sweden, and the US, conducted a study to establish rules for designing stapled α -helical peptides targeting Mdm2(X): optimising lipophilicity, eliminating positive charges, strategically placing anionic residues, adjusting C-terminal length, and optimising staple type. This approach enhances potency and safety, crucial for developing effective, low-toxicity peptide-based drugs.

Srinivasaraghavan Kannan, Bll

Christopher Brown, IMCB

Charles Johannes, ISCE²

A*STAR scientists help discover rules for designing more effective drugs Nature Communications



Unveiling Novel Determinants of Cell Identity through Single-Cell RNA Structure Profiling

A*STAR scientists developed a SHAPE-inspired method called single-cell structure probing of RNA transcripts to study RNA structure variations within and between cells. When applied to human embryonic stem cells and neurons, it reveals that RNA structure is more uniform in stem cells, particularly in coding regions, in contrast to the greater diversity observed in neuronal cells influenced by RNA-binding proteins. This approach highlights the role of RNA structure in defining cell identity and differentiation, surpassing gene expression profiles alone and uncovering novel insights into RNA's functional roles at single-cell resolution.

Wan Yue and Wang Jiaxu, GIS

A*STAR scientists develop method to study the shape of RNA molecules within a single cell a Nature Methods



▲ Beyond RNA expression, each cell has a unique RNA structure profile

Exploring the Impact of Placenta Gene Expression on Offspring Health

A*STAR scientists, working with researchers from Canada, investigated the correlation between placental inflammation in pregnant women and subsequent adult disorders in their children. Using a polygenic score (PGS), researchers quantified and predicted the expression of inflammation expression through Hofbauer cells. The study revealed that disruptions in placental Hofbauer cell function due to preterm birth or prenatal infection increased the risk of depression and cardiovascular disease in offspring.

Michael Joseph Meaney, SICS

A*STAR scientist helps determine how gene expression in the placenta can affect offspring health a Nature Communications

Establishing the Link Between Neutrophils and Tumour Survival: Potential for Cancer Treatment

In a multinational study involving A*STAR, Australia, China, France, Italy, Singapore and Spain, A*STAR researchers discovered that neutrophils entering a tumour are reprogrammed into T3 neutrophils, which enhance tumour survival. Depleting T3 neutrophils can reduce tumour growth, offering therapeutic potential by modulation of pro-tumoural neutrophil responses.

Melissa Ng and Ng Lai Guan, SIgN

A*STAR scientists lead an international team to determine how certain white blood cells support tumour growth Science



Observing How Cells Move Towards Stiffer Substrates



In a collaborative study with Korean and Singapore scientists, A*STAR observed how mouse cells developed higher traction forces on stiffer substrates. This force imbalance stimulates cell movement via directionality, and this greater understanding of cell movement has significant implications for managing cancer metastasis and wound healing, among other disease conditions.

Brian Burke, A*SRL

A*STAR scientist helps determine the mechanism by which cells move towards a stiffer substrate a ACS Applied Materials & Interfaces

Identifying Prolonged Presence of Perfluorooctanoic Acid (PFOA) through Physiologically Based Toxicokinetic (PBTK) Modelling

PFOA is a member of the "forever chemical" family of biologically persistent contaminants, commonly found in food contact materials such as non-stick cookware. A*STAR scientists developed a PBTK model to explain the prolonged presence of PFOA in humans. They identified monocarboxylate transporter 1 as a key uptake transporter, crucial for its widespread tissue distribution and urinary reabsorption. The validated model clarified discrepancies in PFOA half-life estimates and highlighted the role of renal transporters in its persistence, aiding in the comprehensive risk assessment of other forever chemicals with important applications in food safety.

James Chan, SIFBI

A*STAR scientists identify protein responsible for retaining and transporting an environmental toxin Environmental Science & Technology



Inhibiting Melanoma Cells' Immunity to Therapeutic Treatments

A*STAR scientists collaborated with researchers from China and the US to identify nerve growth factor (NGF) as a pivotal immune suppressor in melanoma. Targeting NGF with larotrectinib enhances the efficacy of immune checkpoint therapy, enabling memory T cell formation and potentially preventing melanoma recurrence by overcoming immune resistance. This marks a significant advancement in the treatment of skin cancer.

Li Qi-Jing, IMCB

A*STAR scientist helps identify protein that may be key to fighting skin cancer value and value

The research identifies the NGF–TrkA axis as an important suppressor of anti-tumor immunity, suggesting larotrectinib might be repurposed for immune sensitisation



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Combatting Anticancer Drug Resistance with Innovative Nanocomplexes of Biodegradable Anticancer Macromolecules

In collaboration with IBM (US) researchers, A*STAR scientists have addressed anticancer drug resistance using anionic biodegradable polycarbonate carriers to neutralise the unselective toxicity of positively charged macromolecules. These carriers self-assembled with anticancer polymers, effectively inhibiting both drug-susceptible and resistant breast cancer cells. The nanocomplexes improved drug half-life, reduced toxicity, and demonstrated significant tumour suppression without harming vital organs, suggesting promise for overcoming drug resistance in cancer therapy.

Yang Yi Yan, BTI

A*STAR scientists help develop new anticancer drug with lower side effects Advanced Healthcare Materials

Stronger and Longer-Lasting Monovalent Vaccine Combination Against Omicron XBB

Scientists from A*STAR, collaborating with researchers from Singapore, conducted a study to characterise the immune response to Omicron XBB. They found that it evades antibodies more effectively compared to Omicron BA.1. The study demonstrated that three doses of mRNA vaccine increased antibody levels, with mRNA-1273 proving more effective than BNT162b2. Sustained differences in response were observed up to six months after the booster dose. Overall, the study underscores the importance of comprehending the mechanisms that drive varying antibody responses induced by different vaccine formulations.

Lisa Ng, A*STAR ID Labs

A*STAR scientists help to show that a mixture of mRNA vaccines can be more effective against the COVID-19 virus The Lancet Regional Health - Western Pacific



Identifying Enhanced Galactose Oxidase (GOase) to Produce a Greater Variety of Building Block Molecules

Through directed evolution and computational modelling, A*STAR scientists significantly enhanced GOase allowing it to work on a variety of complex molecules important in pharmaceutical and agrochemical sectors. The improved enzyme has up to 2400-fold increase in activity, is less picky about the handedness of the molecule it binds to, and has increased stability at higher temperatures. Computational tools such as YASARA, FoldX, SCWRL, and Glide help to understand how the enzyme structure relates to its catalytic activity. These advancements make it easier to create tailored enzymes and accelerate the development of biocatalysts.

Sebastian Maurer-Stroh, Bll

Lim Yee Hwee, ISCE²

Ang Ee Lui, SIFBI

A*STAR scientists identify variants of a key alcohol-oxidising enzyme to produce a greater variety of building block molecules ACS Catalysis



PHYSICAL SCIENCE AND ENGINEERING

Determining Role of Surface Charges in Discovering More Efficient Catalysts

A*STAR scientists, in collaboration with researchers from Singapore and the UK, have discovered a correlation between the yield of multi-carbon products and surface charges on the catalyst surface. These surface charges, influenced by the population density of absorbed species, can explain the electrocatalytic CO_2 conversion selectivity, and represent a key factor for future discoveries of more efficient catalysts.

Albertus Denny Handoko, Lim Yee Fun, ISCE²

Zhang Jia, IHPC

A*STAR-led research discovers key to more efficient catalysts Nature Communications



▲ The histidine remains on the surface after the in-situ reduction of Cu_2O to Cu during catalysis, boosting reaction selectivity towards C_2 + products. Other organic functionalisations can be introduced by swapping the reagents during synthesis



Advancing Sustainable Computing with Skyrmionic Technology

Magnetic skyrmions, the smallest magnetic entities, hold great potential as mobile bits for computing. However, they have not been readable through traditional microelectronic devices. A*STAR scientists have led the development of a wafer-scale magnetic tunnel junctions (MTJs) capable of electrically reading and switching skyrmions. This paves the way for a more energyefficient and powerful computing platform.

Anjan Soumyanarayanan, IMRE

A*STAR-led research integrates smallest magnetic entities with microelectronic devices for energy-efficient computing Nature

PHYSICAL SCIENCE AND ENGINEERING

Developing New Materials to Advance 6G Wireless Communications

To realise the envisioned 6G wireless network, which aims to deliver fast and reliable communication via electromagnetic waves in the terahertz spectrum, A*STAR researchers are employing vanadium dioxide (VO_2) patches to enhance the precise steering of terahertz waves. Leveraging the unique phase transition properties of VO_2 , this innovation enables precise control of wave transmission angles. Scaling up this approach could enable a comprehensive 6G solution for full 3D terahertz beam manipulation, supporting future wireless communication networks.

Wang Nan and Prakash Pitchappa, IME

A*STAR-led research develops new materials to advance 6G wireless communications Advanced Optical Materials





Unlocking Understanding of Dislocation Kinetics for Designing Superior Alloys

Scientists from A*STAR, Hong Kong and the US studied the effects of shortrange ordering (SRO) in refractory high-entropy alloys (RHEAs) and found that SRO significantly influences the deformation of RHEAs. This discovery marks a key insight for future design of alloys with superior mechanical properties.

Zhang Yong-Wei, IHPC

A*STAR scientist helps understand deformation in high entropy alloys for future design of superior alloys and the second second

PHYSICAL SCIENCE AND ENGINEERING

Enhancing Performance of Additive Manufactured Al Alloy

A*STAR, in collaboration with researchers from Singapore, have devised an approach to fabricate a high-performance aluminum alloy using additive manufacturing, for in-depth process-microstructureproperty studies. The success underscores the significance of plastic stability, offering insights that can be leveraged to achieve improved strengthductility trade-offs in AM alloys in the future.

Sharon Nai, SIMTech

A*STAR scientist helps fabricate structurally superior aluminium alloy by additive manufacturing to point the way for future design and manufacture of similar alloys Advanced Materials



Improving Machinery Failure Prediction with Predictive AI



Scientists from A*STAR and the US have developed an adaptive neural network for predicting the remaining useful life of machines. This dynamic network adjusts its architecture according to input data, offering greater accuracy compared to existing solutions.

Li Xiaoli and Chen Zhenghua, I²R

A*STAR scientists develop new AI model that more accurately predicts machinery failure IEEE Transactions on Industrial Informatics (TII)

Utilising Electrified Conversion to Reduce Greenhouse Gases

Chemical manufacturing is a significant contributor of greenhouse gas emissions. A*STAR, together with scientists from Canada, Germany and the US, investigated the use of electrolyser systems for electrically powered hydrocarbon-to-oxygenate conversion. Their findings revealed a substantial reduction in greenhouse gas emissions, offering potential for cleaner methods of chemical synthesis and a more sustainable chemical industry.

Leow Wan Ru, *ISCE*²

A*STAR scientist helps discover a greener way to synthesise chemicals Nature Communications





OUR SUSTAINABILITY EFFORTS

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A*STAR champions sustainability through initiatives that address environmental stewardship, social responsibility, sustainable research projects and strong corporate governance. This commitment drives positive changes for A*STAR and the communities we serve.



DEMONSTRATING ENVIRONMENTAL STEWARDSHIP

A*STAR planted six trees at JTC Corporation's Go Green @ one-north campaign as a symbolic gesture contributing to NParks' OneMillionTrees by 2030 movement. The movement aims to restore nature back to our city and redouble our efforts to green our urban infrastructure.

A*STAR also participated in an islandwide clean-up movement organised by the Public Hygiene Council. Close to 200 A*STAR staff and their families rolled up their sleeves to pick up litter at the F1 Pit Building, showcasing a strong commitment to environmental sustainability.

This was one of the largest clean-up events in Singapore, with a record-setting number of participants in an islandwide clean-up. The SG Clean Day event saw over 4,300 volunteers, including A*STAR participants, and surpassed the previous record of nearly 1,800 participants set in 2015.

POWERING DOWN, BRIGHTENING UP

Opened in 2004, A*STAR's ISCE² building, faced a significant energy drain: its fluorescent emergency lights consumed a staggering 45,552 kWh annually. Recognising the environmental impact, the Labs and Facilities Management team spearheaded a project to replace these outdated fixtures with energyefficient LED lights.

ISCE² replaced 139 exit lights, 323 emergency lights and 35 twin floodlights, slashing the building's energy usage on emergency lighting by 89%. This initiative minimised the building's environmental footprint and served as a springboard for future energy-saving initiatives across A*STAR.



▲ Fluorescent emergency lights were dated and consumed a lot of energy



▲ Replacing fluorescent lights with LED lights helped reduce energy consumption by 89%

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PROMOTING SAFETY AND SUSTAINABILITY IN THE WORKPLACE

A*STAR held its annual Safety & Sustainability Day to promote a safe, healthy work environment while fostering a green corporate culture. Under the theme "Safe Workplace, Healthy Employees, Sustainable Future," the event offered engaging activities that highlighted common workplace safety hazards and practical sustainability practices relevant to our staff's daily operations.

Our research institutes presented their sustainability R&D projects. Examples included SIMTech's Green Compass initiative, an assessment and roadmapping tool to help companies to become more environmentally sustainable, and innovative technologies from IMRE to upcycle expired solar panels into heat-harvesting electricity materials and transform waste plastic bottles into polymers used in lithium-ion batteries. Staff also actively participated in hands-on workshops on more sustainable living practices, such as creating cleaning products from fruit enzymes and crafting eco-friendly holiday decorations.









ADVANCING SUSTAINABILITY THROUGH GLOBAL COLLABORATION

A*STAR is committed to sustainability through collaboration with local and international stakeholders from both private and public sectors.

A*STAR participated in the Sweden Indo-Pacific Business Summit, with Professor Yeoh Lean Weng, Chief Sustainability Officer of A*STAR, serving as a keynote panellist. Professor Yeoh emphasised the critical role of R&D in enhancing the costcompetitiveness of sustainable technologies. The summit, organised by the Embassy of Sweden, was attended by Swedish and regional business delegations, including Mr Heng Swee Keat, Deputy Prime Minister for Singapore, and Mr Johan Forsell, Sweden's Minister for International Development Cooperation and Foreign Trade.

In his address, Professor Yeoh underscored the importance of collaboration between the public sector, academia, and industry to accelerate the development and deployment of sustainable low-carbon technologies. He highlighted key areas such as Carbon Capture, Utilisation, and Storage (CCUS), Sustainable Aviation Fuel (SAF), and high-value chemicals and fuels. These technologies are vital for decarbonising industries and achieving the objectives of the Singapore Green Plan 2030 and our net zero ambitions.



HAPPY, HOMELY, HAPPENING A*STAR

At A*STAR, we believe that a thriving research community is built not just on groundbreaking ideas, but also on a culture that fosters creativity, belonging, and well-being. We feature the valuable work of our diversity and inclusion groups, efforts to support well-being of our staff, the vibrant activities of our various interest groups, and the numerous events that bring our community together.

CHAMPIONING DIVERSITY AND INCLUSION

Comprising volunteers from various research institutes and corporate divisions, the Diversity Working Group (DWG) leads initiatives that build a culture that encourages, supports, and celebrates diverse voices across the organisation.

A*STAR Diversity Day

The annual A*STAR Diversity Day convenes A*STAR leaders and external guests for a dialogue and this year's event explored critical topics: gender equality in STEM, unconscious bias, mentorship and building inclusive teams across age groups and seniority levels.

We also celebrated Diversity Champions, who were nominated by colleagues for not only advocating inclusivity, acceptance and understanding, but also actively leading by example and embodying the change they want to see at A*STAR through their day-to-day actions.



International Women in STEM & Medicine Symposium 2024



In conjunction with International Women's Day, DWG co-organised the International Women in STEM & Medicine Symposium 2024, bringing together 10 women-centric organisations from the medical, healthcare, and STEM fields in Singapore.

The symposium featured three panel discussions with the themes "Women's Health and Development", "Becoming Board-Ready" and "Advancing Women in Tech", inspiring women in these sectors to continue excelling in their careers. Prof Lisa Ng, ED BMRC and A*STAR ID Labs, spoke about her journey and insights, encouraging female researchers to venture beyond traditional paths.

CHAMPIONING DIVERSITY AND INCLUSION

Networking Events

Through networking events, DWG cultivates a support network of collaboration, mentorship, and friendship for female researchers to tackle challenges within their scientific fields. Ground-up initiatives by A*STAR's IME, SIMTech and ARTC have extended to career development strategies and enhancing workplace communication, further benefitting new working mothers in particular.



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Unconscious Bias Course

To foster a more inclusive environment where every talent is recognised and valued, DWG collaborated with the Learning & Organisational Development (L&OD) team to curate a LinkedIn Learning course aimed at mitigating unconscious bias in the workplace. This initiative aims to enhance awareness and inclusivity, with all A*STAR officers strongly encouraged to participate in creating a more equitable and supportive organisational culture.

COMMUNITY ENGAGEMENT

Celebrating Inclusion at the Purple Parade 2023



A*STAR participated in the annual Purple Parade on 4 November 2023, Singapore's largest ground-up movement to Support Inclusion and Celebrate Abilities of Persons with Disabilities. More than 30 colleagues and their family members gathered to join the Purple Parade march at Suntec City, flying the A*STAR flag high.

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Helping Ex-offenders and Trauma Survivors Rebuild Their Lives

Highpoint Community Services Association's (HCSA) STEP UP Mentoring Programme facilitated 13 successful pairings in its second cohort, including three A*STAR volunteers as mentors and mentor support. Over six months, the volunteers worked closely with mentees to identify strengths and goals, overcome challenges, and enhance communications skills for personal growth and smoother reintegration into society.

Breaking Barriers to Education

Demonstrating A*STAR's commitment to social responsibility, the CSR Committee and Rec Club came together to launch a fundraising campaign for Pathlight School, Singapore's first autism-focused school offering the national curriculum along with life readiness skills. The campaign raised over S\$15,000 which will enable the school, supported by Community Chest, to provide more holistic and comprehensive support for the students.

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Enriching the Lives of the Senior Community

In the spirit of giving back, A*STAR's Office of Sustainability, Infuse, and the CSR Committee teamed up for a preloved item donation drive held just before Christmas. Staff generously donated or purchased thoughtful items, raising over S\$500 for Lion Befrienders Service Association (Singapore), a voluntary welfare organisation dedicated to providing holistic care for seniors to age healthily and enjoy purposeful lives. The remaining preloved items were donated to underprivileged individuals and residents of one-room flats in Geylang Bahru and Whampoa, with the support of the Salvation Army Church. This initiative provided a meaningful opportunity to celebrate the season while promoting environmental consciousness.



PRIORITISING MENTAL WELL-BEING

Building a Supportive Environment from Ground Up

Wellness Ambassadors (WAs) are staff volunteers passionate about advocating well-being and positive communication. They are trained to support colleagues in coping with work-life stressors for a better quality of life, with the intent of raising mental health awareness and creating a caring work culture in A*STAR.

The team of over 100 WAs develops well-being solutions, pulse checks to assess A*STAR's well-being landscape and activities, such as support meetings with distressed colleagues, mindfulness workshops, fitness challenges, and mental health awareness campaigns.

Since the inception of the WA Programme and Outreach, staff have expressed appreciation for the support received during stressful times and noted a stronger sense of community. The WA Programme was highlighted to the wider Public Service through a video screened on Public Service Week 2023.







 Raising mental health awareness through outreach, sharing sessions and workshops

Encouraging Openness, Fostering Togetherness

In celebration of World Mental Health Day, A*STAR conducted the Eye-Contact Experiment, showcasing the power of simple interactions in enhancing workplace well-being. Staff members engaged in one minute of uninterrupted eye contact, an innovative approach that broke down barriers. Group discussions followed, allowing participants to share their experiences and insights. The experiment's success, documented in a mini-scientific paper, revealed significant improvements in camaraderie among colleagues.





The Eye-Contact Experiment for World Mental Health Day marks the first social experiment of its kind within A*STAR

EVENTS AND CELEBRATIONS

Safe Workplace, Healthy Employees

At A*STAR, we prioritise the health and safety of our staff. In FY2023, we trained over 235 staff members in CPR and AED certification and over 100 as fire wardens, ensuring effective emergency responses. Regular fire drills reinforced these safety protocols. Organised by the Space, Infrastructure & Administration (SpIA) division, the annual workshops go beyond promoting safe practices to include overall wellness through Care Time activities. These range from acupressure massage techniques, insights into the impact of indoor air quality on productivity to craft workshops as a creativity boost.



National Day Observance Ceremony

A*STAR's National Day Observance Ceremony (NDOC) 2023 was held to celebrate Singapore's 58th birthday "Onward as One A*STAR", inspired by the NDP theme of "Onward as One". This theme served to remind the A*STAR community of the collective impact we have. With a strong turnout of 3,000 attendees, NDOC 2023 kicked off with a light-hearted video of A*STAR's senior leadership, followed by engaging performances and exciting games that tested our knowledge of Singapore.



EVENTS AND CELEBRATIONS

A*STAR Dinner and Dance

The A*STAR Dinner and Dance celebrated our achievements and milestones as One A*STAR over the past year. More than 400 attendees came dressed as heroes and villains, and enjoyed performances by our "A*STAR's Got Talent" finalists. The event boosted the employee morale and strengthened our bonds with one another.



A*STAR Family Day

A*STAR Family Day is a Whole-of-A*STAR event for staff and their family members to build stronger bonds, deepen the A*STAR culture as well as promote inclusiveness, diversity and our vision of One A*STAR. We saw over 5,200 staff and their loved ones at Universal Studios Singapore on 8 March 2024 for a night of cherished memories.



OUR COMMUNITY GROUPS

Interest Groups







Badminton





Gardening



oga Bonito





Yoga



Communities of Practice (CoPs) and Centres of Excellence (CoEs)







Culture Builders









Kinesis (ROCK)



Corporate Social

STAR Ambassadors

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KEY PERFORMANCE INDICATORS

RIE 2025 KPIs	A*STAR Achievement in FY2023	RIE2025 Target
Industry R&D Projects	1,375	6,500*
Industry R&D Spending (S\$M)	S\$354.6M	S\$1,200M
Licensing Revenue (S\$M)	S\$11.7M	S\$24M
Number of Licenses	68	N/A
Number of Spin-offs	15	40
Industry Cash Funding Received (S\$M) (Tracking indicator in RIE2025, subset of indicator no. 2)	S\$102M	N/A
Number of Research Scientists and Engineers from Research Institutes Seconded to Industry	40	230
Number of Local R&D Talent Trained or Being Trained	265 (cumulative since the start of RIE2025)	390
In addition to the indicators above, 24.7% of A*STAR publications were amongst the top 10% of the world's most highly cited.		

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*Excludes Characterisation, Measurement and Technical Consultancy (C/M/TC) projects



ORGANISATION DETAILS

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